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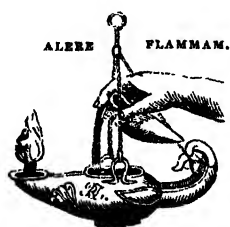
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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportionem, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit."—
LINNÆUS.



. hîc obitus rerum contemplor et ortus,
 Et quibus è causis ordine cuncta fluant.
 Et disco, quidquid varios mare gignit ad usus,
 Quidquid et omnifero terra benigna sinu.
 Sæpe juvat solem gelidâ vitare sub umbrâ,
 Multaque de plantis arboribusque loqui.
 Quid varios pisces, et nata corallia ponto
 Eloquar, et conchis ostrea tecta suis?
 Ille sed æquoreæ numerum subducat arenæ
 Qui volet undivagos enumerare greges.

P. LOTICHI Elegiarum lib. iii. eleg. 4,—lib. ii. eleg. 6.

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VII. }

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X. Organization of the Polygastric Infusoria.

ERRATA AND ADDENDA.

Page 49, line 14 from bottom, }
— 50, — 2, } *for* *Ooctonus* *read* *Speconicus*.
— 50, — 32, }
— 49, — 11, from bottom, *for* *subsessile* *read* *subpetiolatum*.
— 49, — last, *dele* *Eustochus*, *and insert*

Abdomen petiolatum ... *Eustochus*.

Abdomen subsessile ... *Patasson*.

— 50, — 5-6, *for* *tenuissima* *dimidiante* *read* *trientali*.

— 50, — 8, *for* *subsessile* *read* *subpetiolatum*.

— 50, — 20-21, *insert* *Patasson*.

Tarsi 4-meri. Antennæ ♀ 10-art. capitulo 2-art.—♂
13-art. flagello compresso. Alæ anticae vena clavata.

— 52, — 18, *transfer* *I. crassicornis*, to g. *Patasson*.

— 52, — 23-24 *insert* *PATASSON*.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

"..... per litora spargite muscum,
 Naiades, et circum vitreos considite fontes :
 Pollice virginico teneros hic carpite flores :
 Floribus et pictum, diva, replete canistrum.
 At vos, o Nymphæ Craterides, ite sub undas ;
 Ite, recurvato variata corallia trunco
 Vellite muscosis e rupibus, et mihi conchas
 Ferte, Deæ pelagi, et pingui conchylia succo,"
N. Partheni Giannettasii Ecl. 1.

No. 116. JULY 1846.

I.—*On the Circulation of the Sap in the Interior of Cells.*

By HUGO VON MOHL*.

IN a series of observations which I made in the course of last summer on the development of the vegetable cell, the results of which it is my intention to communicate on a subsequent occasion when they have been rendered more complete by further investigation, my attention was directed to the phænomena presented by the nitrogenous constituents of the contents of the cell. I had for years endeavoured to obtain a clear insight into the succession of the metamorphoses these substances, which are constantly changing their form, undergo during the development of the cells ; but I could not succeed in making out a fixed rule in this respect, not knowing how to separate sufficiently the individual and accidental phænomena from those of constant occurrence. Now although the more recent investigations I have made have not presented me with any appearances which I had not frequently seen before, yet I think I have obtained a definite result, insofar as these observations prove that the successive changes of the nitrogenous substances take place in the great majority of vegetable cells in a perfectly analogous manner.

If we consider the place at which, in the interior of a cell, new

* Translated from the *Botanische Zeitung* for Jan. 30, and Feb. 6, 1846.
Ann. & Mag. N. Hist. Vol. xviii. B

cells are on the point of being formed, and at which the nuclei have already made their appearance, as the centres of the future cells, we find that the future mother-cell never contains a transparent aqueous sap, but that a viscous colourless mass, mixed with minute granules, is diffused in greater or less quantity through the cellular space, and is especially concentrated in the vicinity of the cell-nucleus, so that very frequently the outlines of the nuclei appear through this mass but very indistinctly, and cannot be seen accurately without the use of iodine. That this mucous mass which is found in the cavity of the cell previous to the occurrence of the nuclei is the material for the formation of the cellular nuclei (they are coloured yellow by iodine precisely in the same way as the fluid mass) can scarcely be doubted: but whether the nucleus, as Schleiden supposes, is formed simply by the union of the globules floating in the mucous fluid, or whether, which is my own opinion, it is not rather an organic formation increasing by intus-susception which is sharply bounded externally by the mucous fluid, has not yet been determined sufficiently by microscopical observations, and we are unacquainted with any chemical data capable of affording assistance in this examination, both the chemical constitution of the globule and that of the nucleus itself not being satisfactorily explained. It certainly however deserves to be remarked, that according to the investigations of Mulder and Harting, neither the nucleus nor the primordial utricle can be regarded as proteine compounds, as they are frequently imbued with proteine, but are also met with perfectly free from it, and consist of a substance which it is true cannot yet be well characterized chemically, but which is distinct from the other solid structures of the cell. Precisely in the same way as a separation occurs interiorly between the viscous mass mixed with granules and the solid substance of the nucleus, does the formation of the primordial utricle likewise appear at the periphery to proceed from this mucous fluid; but as it is not my object to enter at present upon an examination of the primordial utricle, and the question whether it should be considered as an independent membrane, or as a layer of the above fluid merely coating the walls of the cell, having treated of those questions on a former occasion, I shall reserve some further observations on this subject for a future paper, and shall confine myself for the present to the consideration of the phenomena which are observed in the semifluid nitrogenous substance diffused in the cavity of the cell.

Since, as we have already observed, this viscous mass everywhere precedes the first solid formations indicative of future cells where cells are to be formed; since we must moreover admit

that it furnishes the material both for the formation of the nucleus and of the primordial utricle, which stand not only in the nearest relation as to space, but react towards iodine in an analogous manner, consequently that their organization is the process which induces the formation of the new cell, I trust it will be considered justifiable if I propose to designate this substance by the word *protoplasma*, a term which recalls to mind its physiological function*.

With respect to the relative position of the protoplasma to the nucleus, the form of the latter, and its position with reference to the wall of the cell, I cannot quite agree with my friend Schleiden. According to his statement (Grundz. d. wiss. bot. 2nd edit. i. p. 198), the nucleus represents a plano-convex, generally lenticular body, which is applied to the inner wall of the cell, frequently adhering firmly to it, and in many cases being even inclosed by a doubling of the cell-wall. I must, from my investigations, take a different view of the relation of the nucleus to the cell-wall. In my paper on the structure of the vegetable cell I have already mentioned that the nucleus is not immediately applied to the cell-wall, but is situated within the primordial utricle, either resting against one of its side-walls or being suspended by filaments in its centre. My recent researches have shown me that the apposition of the nucleus to the side of the cell is a secondary state under all circumstances, and that in the earliest stage of the cell the nucleus is always situated in its centre, surrounded by a layer of protoplasma. I have on a former occasion† described the remarkable changes in position of the nucleus in the mother-cells and spores of *Anthoceros levis*, and I have found that this relation is very general. That the position of the nucleus is originally central may most readily be observed by the examination of young hairs; for here, when they are turned round their axis, not the least doubt can exist as to the central position of the nucleus; for instance, in the hairs of the filaments of *Tradescantia virginica*, *T. Sellowiana*; in the hairs on the young leaves of *Saxifraga decipiens*, &c.; and likewise in cells which lie together in masses, for instance, in the cells of the albumen of *Paeonia*, of *Leguminosæ*, in the young vascular utricles of monocotyledonous roots; in short, I arrived at the same result wherever I examined young cells. The space between the nucleus and the cell-wall is, in most cases, somewhat narrow in the young cell, the nucleus occupying at first a very

* The author objects to the term mucilage, employed by Schleiden to designate this substance, as the term vegetable mucilage, in the sense in which it is ordinarily used in chemical works, conveys a totally different meaning.

† On the development of the spores of *Anthoceros levis*, Linnæa, 1839.

considerable space in proportion to the cell ; so that, for instance, when a whole series of cell-nuclei overlying one another lengthwise is formed in hairs, the intermediate space between the individual nuclei is very narrow ; and when subsequently the horizontal walls have formed, each nucleus almost joins the upper and lower horizontal walls of its cell.

This relation generally disappears very soon, the cell either expanding alone, or when the nucleus, which frequently happens, grows even after the formation of the permanent cell-membrane, the cell increases far more considerably in its relative size.

The space between nucleus and cell-wall is at the commencement, almost in all cases, entirely filled with the granular mucous protoplasma. On treating such a cell with dilute tincture of iodine, the protoplasma shrinks together, coagulating with the assumption of a yellow colour ; and when the cell is already somewhat advanced in its development, it does not solidify uniformly to form a dense globular mass, but in such a manner that some smaller and larger roundish cavities are formed in its interior, which mostly run into one another at some points. The appearance of the cell is essentially modified by this. In its centre is situated the nucleus surrounded by a thick layer of protoplasma, its walls are in a similar manner coated with a layer of this substance, and between the two layers are some thicker or thinner diagonal walls or columnar connecting pieces which maintain the nucleus in its position and which traverse the cell diagonally.

Analogous changes in the distribution of the protoplasma to those which may be produced artificially by tincture of iodine in the young cells, occur naturally in those cells whose development is more advanced. Irregularly scattered cavities form in the protoplasma, which become filled with aqueous sap. At first these cavities are generally small and separated from one another by thick layers of protoplasma ; but in other cases, likewise at an early period, some larger cavities occur, while the remaining space of the cell is still uniformly filled with granular protoplasma. The older the cell and the more it expands, the more numerous and large do these cavities become ; at first they are separated from one another, and it has then frequently the deceptive appearance as if thin-walled cells filled with an aqueous fluid were contained in the granular protoplasma. Two circumstances however prove the assumption that these bright spaces are surrounded by membranes to be erroneous, however deceptively they may frequently possess the appearance of cells. In the first place, the protoplasma, when it flows out of an injured cell, appears as a viscous fluid which does not mix with the aqueous sap of the cell, and whose cell-like spaces filled with the cell-sap may be made to unite by moving backwards and forwards the

entire mass between two glasses, without the least trace of a surrounding membrane being detectable. On the other hand, an internal movement begins sometimes to be perceptible in the protoplasma even at this period, which does not, it is true, as yet possess the form of a distinct current, but produces a slow change in the form and position of the cavities above-mentioned; thus likewise indicating that they are not cell-spaces inclosed by a membrane, but vesicular cavities in a viscous fluid.

The older the cell becomes, the more do the spaces filled with this aqueous sap increase in size in proportion to the mass of protoplasma. In consequence of this the cavities run into one, and the viscous fluid now forms, instead of perfect septa, only more or less thick filaments, which radiate from the mass surrounding the nucleus like an atmosphere towards the cell-wall, where they turn back, and unite to form retrogressive filaments, and in this manner form a more or less ramified anastomosing network. When the cells lie one above another in longitudinal series, as in the simple articulated hairs for instance in *Tradescantia*, the chief mass of these filaments, united into a thick cord, mostly proceeds in the axis of the cell from the centre of the one diagonal wall of the cell to the centre of the opposite diagonal wall, and inclose the nucleus in the middle of the cell on all sides. Where, on the contrary, the cells lie together in masses, the filaments generally radiate from the central nucleus towards all sides uniformly. There is however no general rule in this respect; thus for instance, in *Zygnema*, notwithstanding the bead-like apposition of the cells, the nucleus is suspended to filaments which radiate on all sides without any particularly thick and numerous filaments proceeding through the axis of the cell.

It may perhaps not be superfluous to draw attention to a phenomenon which I am not yet able to explain. At the period when the previously isolated cavities begin to flow together the cell acquires a very peculiar appearance, resulting from the different refracting powers of the substances contained in it. The spaces, for instance, situated in the protoplasma frequently appear, not as if they were cavities filled with a thin aqueous liquid, but as if they consisted of masses of a semi-fluid substance, refracting the light more strongly than the surrounding protoplasma. Except in the absence of colour, they look very much like the red masses which are contained in the cells of *Bangia atropurpurea*. This appearance subsequently changes, and frequently under the eyes of the observer, when the cells are placed in water, and these places are then readily perceived to be cavities which are filled with an aqueous liquid. Now whether at the time when they resemble solid masses a substance is dis-

solved in the liquid filling these cavities possessing a great refractive power, and which subsequently again disappears, or whether the phenomenon is due to other causes, I have not been able to ascertain.

When the protoplasm has assumed the form of filaments, a current may almost always be observed in them. This may of course be easily detected when readily perceptible globules are contained in the currents, as in the filamentary hairs of *Tradescantia*, in the stinging hairs of *Urtica*, in the hairs of the melon, &c. ; but where, on the contrary, this is not the case, and the filaments consist of a very homogeneous transparent mass, as for instance in the hairs of *Alsine media*, the existence of the current can only be inferred from the change of position in the filaments. With respect to this alteration in the position of the currents, the cessation of some and the origin of others at fresh places where none previously existed, this phenomenon had been already described by others, especially by Meyen and Schleiden, so accurately, that it would appear quite unnecessary to mention it here were it not for the sad reality, that in opposition to all the earlier and very accurate observations, the correctness of these observations have not merely been denied with the most positive certainty by two parties quite recently, but that perfectly untenable theories have been advanced of the perforation of the cell-walls by the milk sap-vessels in which the currents described are said to occur, or of secondary cells contained in the cell-cavity in whose intercellular spaces the granular fluid is said to be contained. The assumption of solid tubular or membranous formations in or between which the moving fluid is said to be contained, must be entirely rejected by every one who has had an opportunity of convincing himself of the variability of these currents, and any observation made with tolerable care will soon yield this conviction most satisfactorily. It has frequently happened to me, that even in the short time which I required for drawing the currents contained in a cell, for instance of *Tradescantia*, their position and number were essentially altered ; but not merely the delicate currents which run free through the cell-cavity or along its walls alter their position, but in many cases even the position of the nucleus, when it is situated in the axis of the cell in the midst of the mass of currents which run from the centre of one horizontal wall to the centre of the opposite one, is subjected to a slow but still very decided change. I have observed this motion taking place in the direction of the axis, alternately ascending and descending, and repeated in a very decided manner, on the filamentary hairs of *Tradescantia Sellowiana*, some of which I took from buds which were not more than half deve-

loped, and others from flowers which had just opened*. This movement took place so slowly that the nucleus required from a quarter to half an hour to pass through one-third or half the longitudinal axis of the cell, progressing not more than about $\frac{1}{3750}$ th of a Paris line in a second. A somewhat slower motion, the velocity of which however I forgot to measure, in which the nucleus glided along the cell-wall, was observed in the linear primordial leaves of *Sagittaria sagittifolia*; the same may be very readily observed in the leaves of *Vallisneria spiralis*, the nucleus here following the current of sap with the same velocity as the granules of chlorophylle. The following phenomena, which I observed on the stinging hairs of *Urtica baccifera*, yield, together with this change of position of the sap current and nucleus, a further proof against the existence of a vascular system or inner cells. I left a leaf of this plant lying for a couple of days on the table, so that with the exception of the large ribs and the stinging hairs situated on it, it was perfectly dry. Now in these faded hairs the currents appeared to be very much altered; some still existed in the natural state and were in motion, but in the greater portion the granules had separated and were distributed with tolerable uniformity over the surface of the cellular membrane, and exhibited a molecular motion. When some of the hairs which had been cut off had lain in water for half an hour and were again full of sap, the granules arranged themselves more and more into filaments, between which were some free spaces and in which the circulating motion was completely restored. In this case, therefore, every possibility of the currents being inclosed between membranes is excluded; indeed the form of the currents of sap, as exhibited in the stinging hairs of this plant, is opposed to that view.

The movement of the current is mostly very irregular; if we leave *Chara* out of the question, it is most regular in *Vallisneria*, but even here it is far from being uniform. The sap flows quicker in one cell than in another, in one current quicker than in the adjacent; frequently stoppages occur at some spots, so that the sap becomes increased for a time, and some granules are overtaken by those behind them, &c. This inequality of the motion renders the determination of the velocity of the current

* It may perhaps be of interest to those persons who may wish to observe the circulation of the sap in the hairs of *Tradescantia* if I describe a manipulation by means of which the layer of air which adheres tenaciously to the surface of the hairs when they are placed in water may be removed, as it diminishes the transparency of the hair and renders the observation more difficult. For this purpose it is only necessary to dip the filament with its hairs for a moment in alcohol, and to wash this off again immediately with water, when the disturbance is got rid of without the circulation of the sap being modified.

somewhat uncertain, or rather it compels us to make a larger series of admeasurements and to draw the mean from them.

Since, as far as I am aware, no observations have been published on the velocity of this motion excepting in *Chara*, the following statements may not be considered out of place. I have only to observe, that all these admeasurements were made at a temperature of 66° to 68° Fahr., and that the influence which different temperatures exert on the phenomenon has not yet been investigated. In filamentary hairs of *Tradescantia virginica* the velocity of the current varied from $\frac{1}{300}$ to $\frac{1}{900}$ Par. lin. in a second; the mean was $\frac{1}{300}$. In the leaves of *Vallisneria spiralis* the quickest motion was $\frac{1}{125}$, the slowest $\frac{1}{600}$, and the mean $\frac{1}{183}$ line. In the stinging hairs of *Urtica baccifera* the quickest motion was $\frac{1}{625}$, the slowest $\frac{1}{875}$, the mean $\frac{1}{750}$ line. In the cellular tissue of a stolon of *Sagittaria sagittifolia* the velocity varied between $\frac{1}{720}$ and $\frac{1}{1036}$, and amounted on the average to $\frac{1}{854}$; in the leaf of the same plant it varied between $\frac{1}{1170}$ and $\frac{1}{1360}$, the average being $\frac{1}{1253}$ line. In the hairs of *Cucurbita Pepo* the quickest movement amounted to $\frac{1}{70}$, the slowest to $\frac{1}{2700}$, the average being $\frac{1}{1037}$ line. The smallness of these numbers will probably surprise many, especially when they are compared with the apparently considerable velocity which the circulation of the sap, in *Vallisneria* for instance, exhibits under the microscope. But it must not be forgotten, that in these observations the motion is seen quickened several hundred times. The above admeasurements were made in the following manner: while I observed the passage of the image of the globule across the field of a glass micrometer fixed in the ocular, I counted the strokes of a second-pendulum. What the nature of the granules floating in the protoplasmia may be, cannot in most cases be ascertained on account of their minute size; but it appears that they are in all cases coloured yellow by iodine, and are therefore most probably nitrogenous. When granules of chlorophylle occur in the cells, they are situated either, as for instance is the case in the hairs of the melon, isolated and close to the walls of the cells without having any definite relation to the current, and only a few move on with the current, or they are all connected with the current and move with it, as in *Stratiotes aloides* and *Sagittaria sagittifolia*. This form mediates the transition to *Vallisneria*, in whose cells it is not the cellular sap itself which is in rotation, as appears at first sight, but a mucilaginous fluid with which the chlorophylle granules and the nucleus are connected, and which flows in an uninterrupted current along the cell-walls, but on account of its great transparency and slight thickness is not very easily seen. Likewise in *Chara* it is not, as is generally supposed, the cell-sap itself which moves, but

a denser fluid present in large quantity and occupying the outer parts of the cell-cavity, as has been already shown by other observers*.

I dare not venture to express the slightest suspicion as to the cause of this motion. It might be thought that the nucleus acts an important part in it, forming as it does in most cases the centre of the current, which might lead us to suspect that the force producing it may have its principal seat in the nucleus, as in *Chara* it cannot be denied that the chlorophylle granules situated adjacent to the cell-wall have an influence on the circulation of the sap. It appears to me however not probable that the nucleus possesses any such influence. In the first place, it is in many cases in the act of being dissolved precisely at the time when the current is most rapid, at least it is smaller than previously, for instance in the filamentary hairs of *Tradescantia*; on the other hand, the nucleus does not form the centre of the current in *Vallisneria* in those cells in which the circulation is very regular and rapid, but, like the isolated granules of chlorophylle, follows the current without any quickening of the movement being perceptible in its neighbourhood, or any other circumstance tending to show that it had any special function. It is true, I do not recollect having seen such currents in cells in which the nucleus is already perfectly re-absorbed; but this co-existence of the nucleus and current may be accidental, and may be explained from the protoplasm which forms the current being re-absorbed earlier than the nucleus after the development of the cell-walls.

It is remarkable that the nucleus, considering its central position, can be kept in its position in the cavity of the cell, not by solid fibres, but by currents of a fluid, even though tenacious. The observations above described respecting the changes in the position of the nucleus destroy all idea of these currents, and with them the nucleus, possessing a support in fibrous or membranous tissues. We must therefore admit that the protoplasm, notwithstanding its motion, still has sufficient viscosity to retain floating in the aqueous sap of the cell so small a body as the nucleus. The older the cell becomes the more does the substance of the current appear to harden, so that in some cases at least it loses all its liquid and the currents become solid filaments. I noticed this appearance most strikingly in the flesh of the fruit of *Rhamnus frangula*, in which there are some cells which are far larger than the surrounding, and in which is situated a nucleus fixed to filaments. These filaments

* Schleiden, Grundzüge, 2nd edit., p. 292, and Hassall, British Freshwater Algæ, i. p. 85.

possess such firmness that they can be cut through horizontally with a sharp knife and nevertheless remain in their position. The larger of them are frequently flattened, but I could not find a trace of membranes by which they might be retained so firmly in their position. Similar solid filaments are met with in the larger cells of the fruit-parenchyma of *Ribes nigrum*: in this case also the upper and lower side of the cell may be cut away without the filaments running through their centre being moved out of their position.

II.—*List of the Birds observed to winter in Macedonia; from Notes made by Capt. H. M. DRUMMOND, 42nd R. H., during a two months' Shooting Excursion in the Interior during the winter of 1845-46.*

I AM not aware if Macedonia has ever been fully explored by any naturalist with a view to its ornithology, but from the general appearance of the country, its rich and varied landscape, abounding in high mountains as well as extensive plains, in some parts richly cultivated, in others clothed with vast extents of forest intersected by numerous lakes, rivers and marshes, as also from its geographical position, being so directly in the line of migration of all those species which pass up the Archipelago, it becomes one of the most interesting fields to the ornithologist, and I have no doubt, were it visited also during the spring and summer months, it would be found to possess many rare and beautiful species, and some even new to the European fauna.

Vultur cinereus. A few of these rare and magnificent birds were seen in the large wooded plains, generally perched on the naked limb of some dead tree, where they sit for hours, seeming to prefer perfect solitude, never mixing with the other vultures; they were never observed on the mountains, but probably regulate their movements according to the herds of cattle which at this season are all brought down to the low grounds.

V. fulvus. Most numerous on the plains as well as the mountains.

Cathartes percnopterus. } A few seen on the mountains.
Gypætus barbatus. }

Falco peregrinus. }
F. subbuteo. } Common.
F. æsalon. }
F. tinnunculus. }

F. imperialis. Rare.

F. fulvus. } Most numerous on the large wooded plains, fifteen
F. albicilla. } or twenty being often observed in the air at once,
 and their nests may be seen in every direction, the largest trees being

generally selected for the purpose. On the 1st of January I observed a pair of golden eagles; the female was on her eyry, while the male was busily employed breaking off branches from the tree: as they always roost in their eyries, they were probably repairing it, having most likely suffered from a heavy gale of wind the day before.

Falco brachydactylus. Not uncommon.

F. leucocephalus. Common, and generally observed in the marshes or those parts of the plains free from wood; solitary, and commonly seen sitting on the ground or perched on any slight eminence, where they keep so good a look-out that it is difficult to approach within shot.

F. palumbarius. One was shot in the act of devouring a rook which he had just killed.

F. nisus. Common.

F. milvus. Most numerous, and seem fond of society, as they roost in company; upwards of fifty of these birds were seen one evening about sunset, sitting upon one tree along with a *F. brachydactylus*.

F. buteo. Very common.

F. lagopus. One seen.

F. cyaneus. } Very common in the marshes.

F. rufus. }

Strix bubo. }

S. otus. } Common.

S. passerina. }

Corvus corax. Common.

C. corone. Not so common as the above.

C. cornix. Most numerous.

C. frugilegus. Though most numerous at this season, no rookery was ever observed in any part of the country, nor could I ascertain whether they were known to breed; therefore probably they are of regular passage as at Corfu.

C. collaris (mihi). This bird, though strongly resembling the *C. monedula*, yet on close examination differs so materially that I have ventured to consider it as an entirely distinct species. The ring jackdaw is about the same size as the common jackdaw, but differs in having the hinder part of the head of a light silvery gray, and a large white crescented patch on each side of the neck, the whole of the back and upper tail-covers dusky and shaded with ash; throat black, the whole of the lower parts lead-colour, each feather darker in the centre, the ring on the female not quite so conspicuous as in the male: these birds are most numerous in all the towns and villages of Macedonia; they were also seen in great numbers in Thessaly, and in one instance only in Albania. The *C. monedula* was never observed.

Garrulus pica. Most numerous, and may be seen every evening in long strings repairing to the reeds on the banks of the Vardar and Karrasmak, where, along with the starlings, they roost in myriads.

G. glandarius. I was unfortunately unable to procure a specimen of these birds while in Macedonia; though common, they were so

excessively shy, that I was prevented from ascertaining whether they differed from the common jay of England ; but as I afterwards procured several specimens both in Thessaly and Albania, which were the common *G. glandarius*, I have no doubt that those in Macedonia were the same.

Sturnus vulgaris. Most numerous.

Lanius excubitor. Rare.

Turdus viscivorus. A few seen.

T. pilaris. Common.

T. musicus. Very common.

T. iliacus. A few seen.

T. merula. Very common.

Sylvia rubecula. Very common.

S. hippolais. Common.

Regulus cristatus. } Common.

R. ignicapillus. }

Troglodytes vulgaris. Very common.

Saxicola rubicola. Very common.

Accentor modularis. Not uncommon. This is the first time I have observed this bird (so numerous in England) in the south of Europe.

Motacilla alba. } Common.

M. flava. }

Anthus pratensis. Very common.

Alauda arvensis. Most numerous, and seen in immense flocks.

A. cristata. Very common ; generally seen in small trips of five or six birds frequenting the roads and horse-paths.

A. calandra. Common on the plains and seen in flocks of about twenty.

Parus major. } Common.

P. cæruleus. }

P. palustris. }

P. caudatus. }

Emberiza citrinella. Seen only on the mountains at about 3000 feet above the level of the sea, where they were pretty numerous : this is the first instance of my having met with this bird in the south of Europe.

E. miliaria. Very common.

E. schæniculus. } Common.

E. cirrus. }

E. cia *.

Pyrrhula vulgaris. }

Fringilla coccothraustes. } Common.

F. chloris. }

F. domestica. }

F. montana. A few seen. It is worthy of notice, that in travelling through Bulgaria and part of Servia in the summer of 1836, I in no one instance met with the *F. domestica*, but found it completely replaced by the *F. montana*, which abounded in all the towns and

* This bird was not mentioned as an inhabitant of Corfu, but I have since met with it in considerable numbers during the winter.

villages, breeding under the eaves of the houses, and on the 13th of June I took their eggs from the thatch of a cottage near Negotin in Servia; I also observed them to have the same habits in some parts of Hungary. The roller and bee-eater I also found in great numbers, breeding in company on the banks of the Danube near Rudschuk in Bulgaria, on the 8th of June: they form their nests in holes on the perpendicular banks like the sand martin, and invariably occupied the same places.

Fringilla cælebs. Most numerous, and found high up on the mountains as well as the plains.

F. montifringilla. A few seen.

F. cannabina. Common.

F. carduelis. Very common.

Picus viridis.

P. major.

P. medius.

P. minor. Not so common as the above-mentioned.

Sitta europæa. One or two seen.

Certhia familiaris. This seems to be a rare bird here, as one individual only was observed.

Alcedo ispida. Common.

Columba palumbus. Common.

C. anas. Very numerous and seen in large flocks.

C. livia. Not nearly so common as the above.

C. —. A pair of these birds were seen flying about in a village near Berea or Varea (as it is now pronounced), and were apparently in a wild state. Not having seen Mr. Gould's valuable work on the 'Birds of Europe,' I know not whether he has included the collared or Barbary turtle in the European fauna; it is however deserving of a place, as I observed them in all the towns and villages in Bulgaria; I also noticed them at Constantinople in the months of May and June, when they were abundant, breeding in the cypresses in the extensive cemeteries of Scutari and Pera. Capt. Kinloch, late of the 42nd, informed me that they were abundant in Rhodes, and that he had also found their nests in the cypress trees*.

Phasianus colchicus. Very abundant, frequenting the dry reeds and osier beds in the vicinity of the rivers and marshes: found only on the plains, not known on the mountains.

Perdix francolinus. I never observed this bird myself, but on the authority of one of the peasants, an intelligent man, who gave me so exact a description of the bird, I have ventured to give it a place in this catalogue; he informed me that they were rare, but that he had shot them in the long grass near the sea.

* As Capt. Drummond gives no description of this bird, it is uncertain whether he here refers to the *Turtur senegalensis* (*cambayensis*, *egyptiaca* and *maculicollis* of authors), first noticed as a European species by myself (Proc. Zool. Soc. 1836, p. 100), and since found abundantly in Greece by Von der Mühle (Ornithologie Griechenlands, p. 83); or to the *Turtur risorius*, a species common in North Africa, and once met with by Naumann on the Balcan (Wiegman. Archiv, 1837, p. 106).—H. E. STRICKLAND.

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Perdix saxatilis. Very common, but found only on the mountains.

P. cinerea. Very common in the plains, but were never observed on the mountains.

P. coturnix. Common.

Otis tarda. Very common, generally frequenting the marshy plains; they were also observed feeding in immense flocks in the plains of Meteora in Thessaly: the call of the male bird is of the most extraordinary kind; it is very loud, and resembled something between the cackling of geese, the croaking of frogs, and the harsh grating of a rusty hinge. May not the pouch with which the male bird is furnished have something to do with this extraordinary cry, as I believe it is not ascertained to what purpose it is applied?

Charadrius hiaticula. A few seen.

Vanellus cristatus. Common.

Grus leucogeranos. A large flock of these very rare birds were seen on the 9th of January; when on the wing they made a hissing noise; I unfortunately was unable to obtain a specimen.

G. cinerea. Very common, and were generally seen in parties of three to five.

Ciconia alba. Very common at this season of the year; they were chiefly found in the open country, not frequenting the towns or villages, but from the quantities of their nests on the house-tops, they must be very abundant in the breeding season.

Ardea cinerea.
A. egretta.
A. egrettoidea. } Very common.

Avocetta recurvirostra. One seen on the 1st of January.

Numenius arquatus. Common.

Tringa variabilis. A few seen.

Totanus calidris. Common.

T. hypoleucos. A few seen.

Limosa melanura. Very common.

Scolopax rusticola. Most abundant.

S. gallinago.
S. gallinula. } Not very numerous.

Rallus aquaticus. Common.

Fulica atra. Very numerous.

Podiceps cristatus.
P. auritus.
P. minor. } Common.

Larus argentatus.
L. canus.
L. melanocephalus. } Common.

Puffinus cinereus. A few seen in the bay of Salonica.

Anser hyperboreus. A large flock of these very rare birds were seen on the 20th of January; when on the wing they were perfectly silent.

A. ferus.
A. segetum. } Very numerous;
A. albifrons. A few seen.

Anser ruficollis. Only one of these very rare birds was observed.

Cygnus musicus. Very common.

Anas tadorna.

A. boschas.

A. strepera.

A. acuta.

A. penelope.

A. crecca.

A. clypeata.

A. nyroca.

A. ferina.

A. clangula.

Common. Wild fowl are most abundant throughout Macedonia, and had I made a longer stay in the country, no doubt many other species would have been observed besides those mentioned.

Mergus serrator. Common.

M. albellus. Very numerous, though none but females were observed; the same remark applies to the Ionian Islands. Might not some of these supposed females have been males, not having assumed the breeding plumage?

Pelecanus onocrotalus. Very common.

Carbo cormoranus. } Common.

C. graculus.

C. pygmaeus. Most numerous.

III.—Observations on the Cell-Membrane of Plants.

By G. H. K. THWAITES*.

IF a decaying vegetable organism is brought before us, in which nothing remains of the former structure but the cell-walls, it is difficult to conceive that this skeleton, as it were, has performed an important part in the vital processes of the plant,—that it has been an agent in the chemical changes which had been going on during the processes of secretion, assimilation, &c.,—in fact, that it has been any other than a mere skeleton for the support of the important parts of the organism: I say that, divesting the mind of preconceived notions respecting the functions of cell-membrane, it is difficult to regard it, under such circumstances, otherwise than in the light I have just mentioned. I hope to be able to show that this is really the view which should be taken of it.

To prevent any misconception of my meaning, I will just state that when using the term "*endochrome*" in the succeeding part of my paper, I wish it to be considered as comprising the entire contents of the cell, including the nucleus or nuclei. The terms *cell-membrane* or *cell-wall* explain themselves.

There cannot be a more satisfactory way of showing the subordinate character of the cell-membrane than by exhibiting a perfect living organism in which it does not exist, and there are

* Being the substance of a paper read at a Meeting of the Bristol Microscopical Society, April 8, 1846.

some plants, belonging to the family *Oscillatorieæ*, in one of which (a species of *Spirulina*) there appears to be no real membrane—the plant consisting of a mucous matrix, out of which, when the species is mature, emerge oscillating spiral filaments, which from their exhibiting no trace of cell-membrane, or even of any division, by *septa*, into separate portions, and from the rapidity with which they become decomposed, I believe to be continuous masses of endochrome held together by mucus. Another species to which I would direct attention is the *Lyngbya ferruginea*, Agardh, a plant scarcely differing from *Oscillatoria*, except in the greater firmness of the membranous sheath which invests each filament: the filaments of this plant are composed of lenticular masses of endochrome, and during the early part of their growth are inclosed in a membranous sheath; from this, however, they emerge when mature, and soon afterwards become broken up into the separate masses of endochrome, each of which appears to be held together by a kind of mucus, and not to be surrounded by a cell-membrane. I am inclined to believe that the *Oscillatorieæ* generally have no real cell-membrane, unless the common sheath, investing each filament, be considered as such. In *Microcoleus*, one of the same family, the filaments are invested with a *mucous* or *gelatinous*, not *membranous* sheath; proving that the membranous sheath which incloses the filaments of the above-named *Lyngbya* is not to be viewed in the light of the ordinary cell-membrane, though its functions are probably identical with it.

When treating of such objects as the foregoing, I am aware of the danger of advancing a negative proposition; of stating that certain structures do not exist, when an improved method of observation may eventually discover their presence: I would therefore request that what has been just advanced may be considered as what I firmly believe to be the case, and not as an absolute indisputable certainty. But the doctrine I would advance does not rest solely upon the possibility of proving the absence of cell-membrane in a perfect organism; though it would naturally derive weight and probability from such a source.

I now proceed to point out instances in which the cell-membrane is seen to be of quite a secondary character; and that its development is regulated entirely by the condition of the endochrome it contains, and that, in fact, it owes its existence to this endochrome. The production of cell-membrane and endochrome has the appearance frequently of being synchronous, but the endochrome may sometimes be seen becoming invested with a cell-membrane, and this may be well-observed during the formation of the spore of *Zygnema* and other species of *Conjugateæ*. Those who have paid attention to this family of plants are well aware, that previously to the formation of the fruit, two cells unite by

means of a short tube developed from each, and through the canal formed by the union of these the endochrome of one of the cells passes into the other cell, becomes mixed with its endochrome, and subsequently around this mixed endochrome a cell-membrane is developed. This membrane would certainly appear to be developed by the endochrome and not by one of the original cell-walls, otherwise we could not expect it to be entirely influenced as to its form and size by the contained endochrome, but that there would be indications of its being independent of this. The spore-membrane, however, not only corresponds in extent with the contained endochrome, but if, as is sometimes accidentally the case, the mass of endochrome has become divided into two portions, each of these portions becomes covered with a cell-membrane; thus showing that the relation is between these, and not between either and the original cell-wall. That a *spore* of *Zygnema* represents a cell of the same plant is well-shown by the mode of fructification of an allied genus, *Vesiculifera*, where it is evident that such is its character (see p. 333).

Amongst the Algae the number of cells is often very much increased by fissiparous division; that is to say, a single cell becomes divided into two (sometimes four): the way in which this takes place is interesting, and I think throws light upon the ordinary production of cells. The process of the fissiparous division of cells may be well-seen in the large species of *Zygnema*; in these the endochrome is arranged in one or more spiral coils within the cell. When the latter is about to become divided, a slight disturbance of the regularity of the spirals may be observed just in that part of the cell where the division will take place; their continuity is subsequently broken at this spot, and soon afterwards the original cell may be seen to have become converted into two, with no apparent disturbance of the endochrome except just at the point where separation took place. [The large nucleus has also become divided into two.] Various explanations have been given of the mode in which the division of the cell takes place, but I believe the correct one is to consider that each half-endochrome develops around it a new cell-membrane—the old one remaining or becoming absorbed. I have certainly seen traces of the original cell-membrane in a fragile species of *Zygnema* found in this neighbourhood. In *Isthmia*, *Meloseira* and other genera which possess a siliceous cell-wall, it is distinctly seen that two perfect cells are developed within the original one, and this would lead us to expect the same thing to occur in all species where this mode of division obtains.

We may now proceed to the consideration of the ordinary mode of development of cells, and there is perhaps scarcely a species in which this can be studied to greater advantage than in the very

common *Conferva glomerata*. In this species the cells are extremely large, and the endochrome is in considerable quantity; and the cells apparently continue increasing in size during the whole period of their vitality, so that those at the base of the plant are larger than those recently developed. Some species of *Conferva* consist only of single unbranched filaments, so that, in these, new cells are added only at one point; but in the species under consideration new cells originate from every part of the plant, and thus we have a favourable opportunity of observing what takes place when a new cell is being produced from one which has been some time developed. A slight protuberance is observed upon the cell-membrane, which has the appearance of being caused by the enlarged contained endochrome endeavouring to force its way out of the cell. This protuberance increases at the same time with an increase of the endochrome, and becomes of some considerable length before there is any appearance of a septum dividing it from the original cell. The endochrome, however, subsequently divides, and a membrane is developed over each of the divided ends; or, what is the probable explanation, a development of cell-membrane has been taking place during the whole process, and, still going on, a membrane is now naturally formed over those ends of the endochrome where the previous continuity has been broken. That an addition is continually being made to the cell-wall is evident, since there is no other way of accounting for the increasing size of the cell and thickness of its membrane.

An abnormal growth which sometimes takes place in the cells or long tubes of *Vaucheria* will serve well to illustrate how immediately an increased production of cell-membrane is consequent upon an additional development of endochrome. The cells of *Vaucheria* are occasionally found to be infested with a species of *Vorticella*, an infusory animalcule. This little animal is seen occupying large pear-shaped protuberances upon the frond of *Vaucheria*, in which it deposits its ova. Now it is interesting to observe the mode in which these peculiar protuberances are formed. The *Vorticella* may, in some instances, be seen within the tube of the plant, and from the slight alteration in the endochrome, it may be inferred that the little animal has not been long present there; in other cases it may be observed that the presence of the *Vorticella* has caused an evident dilatation of the cylinder of endochrome with a corresponding enlargement of the cell-membrane; whilst in other examples this dilatation has gone on so as to have produced a large pear-shaped appendage to the frond, within which the *Vorticella* may be seen moving. But what I would wish particularly to draw attention to is the fact that the stimulus arising from the presence of the *Vorticella* has

been operating immediately upon the internal surface of the cylinder of endochrome, causing an abnormal development of this, accompanying and consequent upon which has been a corresponding and regular development of cell-membrane; showing that the amount of production of cell-membrane is regulated by the growth of the endochrome.

I will now proceed to make a few remarks upon a structure which is developed in greater or less amount in most Algae,—external to the cell-membrane,—possessing some characters in common with it, and probably in many cases performing a similar office in the œconomy of the organism. The structure I allude to is the *mucus* which surrounds the cells of Algae, and in some species, such as in many of the *Palmelleæ*, of considerable extent, so as to make up by far the greater part of the plant. In some of the *Palmelleæ* indeed, the plant at first sight appears to be composed of an amorphous gelatinous mass, containing cells imbedded in it, and would lead to the idea that this gelatinous mass is the matrix from which the cells are developed, and to which they owe their origin; but such is really not the fact. There are some species of *Palmelleæ* which show the character of this mucus very clearly, and in which its development can be traced without difficulty. In *Coccochloris cystifera*, Hassall, a species not uncommon in the neighbourhood of Bristol on rocks and walls, may be readily observed the circumstances under which the mucus is developed, and that this mucus is of definite form and quantity. This species of Alga, like most if not all the *Palmelleæ*, increases not only by an enlargement of its cells and the ordinary reproduction of these from a parent cell or spore, but during the development of the plant the number of cells is very much increased by fissiparous division—each cell becoming divided into two or four—no doubt in the same way as occurs in *Zygnema*, *Isthmia*, &c. Now if the plant, in which this process is going on, be carefully examined, it will be seen that the mucus is developed in definite quantity around each cell and doubtless by it. For we may perceive *one* cell in which there is no indication of fissiparous division; *another* in which this process has just taken place, but the cells are yet in close apposition; *another* in which the two new cells are separated to some distance from each other; and if we examine into what has led to their separation, we may find that this arises from a definite development of mucus around each of them and within the mucous envelope of the original cell; and *lastly*, we may find a pair of new cells of nearly equal size with the original one, each with nearly the ordinary amount of gelatine or mucus surrounding it, and the mucous sheath of the original cell nearly absorbed. In a *Palmella* found in Sussex by Mr. Jenner and sent me by Mr. Ralfs under the name of *P. hya-*

lina, the original mucous sheath appears not to be absorbed, but to be ruptured upon the production of new ones within it. Each cell of some species of this family is surrounded by two or more distinct mucous envelopes; and in some species a cluster of cells is also surrounded by a common mucous sheath, which is no doubt also developed from the cells. In other species of the *Palmelleæ* the cells are raised upon mucous prolongations caused by the development of mucus on one side of the cell. The curved moniliform filaments of the genus *Nostoc* would at first sight appear to grow in a mass of gelatine without any definite arrangement; but when, as is sometimes the case, the plant occurs with a single straight filament, this is found to be surrounded by a gelatine or mucus of definite diameter, showing that in this genus the amount of gelatine depends upon the number of cells. That the gelatinous stipes of *Cocconema*, and therefore of the allied genera, is developed from the frustules, is well-shown in a curious state of *Cocconema lanceolatum* which I have recently found. In this, each pair of frustules, instead of being raised upon a long stalk, has become invested with a definite mucous or gelatinous envelope of the same character as the short stipes to which it is attached, and of which organ it would appear to be an abnormal condition. In *Schizonema* the gelatinous sheath may often be shown to bear a proportion to the number of frustules it contains. In a freshwater species of *Schizonema*, occurring abundantly in the neighbourhood of Bristol, the common mucous sheath is liable to considerable modification according to the circumstances under which the plant grows. It occurs in some situations in the form of a mucous stratum upon the surface of stones; in others the gelatinous sheath is of extreme tenuity and transparency: whereas, if the plant is found in rather deep rapid streams, the sheath is much-developed and becomes of an almost membranous texture; thus showing that this gelatinous structure is of subordinate character, and may vary according to the circumstances in which the plant is found.

Microcoleus possesses a gelatinous sheath, but in the allied genera *Oscillatoria*, *Calothrix*, &c. this is represented by a truly membranous sheath, closely resembling and no doubt identical in function with cell-membrane. This fact, coupled with what is observed during the formation of the spore of *Zygnema*, where the endochrome seems at first to be held together by mucus, would make it appear not unlikely that cell-membrane is really a modification of a similar mucus or gelatine, and that the ultimate structure of both is similar.

In examining the fronds of some of the foliaceous Algæ, it may very readily be perceived that the cells composing it are separated from one another by the interposition of an apparently homo-

geneous gelatinous structure called the intercellular substance. This substance is no doubt analogous to the mucus of the *Palmelleæ*, and of similar character to it. That this is the fact may be well-seen in attending to the mode of development of the frond of *Tetraspora*, in which a quaternary division of the cells takes place, as in some species of *Palmelleæ*: around each of the new cells, though principally on one side of them, is developed a definite amount of gelatine; and in this way the size of the frond is increased. This genus, *Tetraspora*, forms a beautiful connecting link between the *Palmelleæ* and the laminose Algæ; for although the mass of cells is developed in the form of a frond, still these cells have their individual development but slightly modified by forming a part of an entire structure. In some *Ulvæ* the character of a whole compound structure is more manifest, and the individual cell-life begins to appear secondary; and as we advance higher in the scale of vegetation, the latter ceases to speak plainly to our senses.

If what I have said respecting the intercellular structure is true of the Algæ, the same explanation would apply to that structure in the higher plants, where it is often very conspicuous; and it appears to me not improbable, that the deposits of sclerogen as well as the firm portion of the spiral fibre may be considered as structures of a similar character. The pellicle which covers the cuticle is doubtless so.

Now what is the character of the mucus which we have seen to be developed in definite quantity outside and around the cell-wall? That it is not a mere chemical solution of starch would appear evident from its persistence when mounted for the microscope in water and other fluids. Its toughness and elasticity, the readiness with which it allows water to permeate it, and its recovering its original form and consistence upon being moistened after desiccation, seem to warrant the belief that it possesses an organized form of the same mechanical properties as sponge; and if we could resolve it under the microscope into its ultimate structure, we should probably find that its texture would be best expressed by the term *spongy*; though I would not wish it to be supposed I believe it to have the complicated structure of real sponge, but to consist rather of a mat of delicate fibres.

And as, in viewing a series of Algæ, a transition may be observed from a mucous structure to one possessing the external characters if not the functions of cell-membrane; it may be fairly inferred that cell-membrane is of a very similar mechanical structure, and we should perhaps not be far from a right definition in applying to it the term *felt*, as indicating its real characters.

After duly weighing the foregoing phenomena and others of a similar character, I have arrived at the conviction that the cell-

membrane is quite a subordinate part of the living structure; that its functions are of a purely physical character; that its principal office is to protect, locate or isolate the matter it contains; and that any vitality it possesses is derived from the presence within it of its endochrome. There are, however, a few phenomena which at first sight would appear to militate against the opinion I have advanced; I mean the contractility of certain membranes, and the movement of ciliary appendages belonging to others. It is very certain, that during the vital processes which are going on in the interior of the cell, considerable chemical changes are taking place; and these must of necessity give rise to an elimination of electrical currents. The presence of such currents would, I think, be sufficient to account for the rhythmical movement of cilia, as well as for the contraction of membranes of certain mechanical structure.

I would ask whether these electrical currents may not give rise to the formation of the mucus surrounding the cell, and determine its character and extent; whether, too, the production of cell-membrane may not occur under a similar influence; and whether this would not be the easiest solution of the problem of how the cell is increased in size? viz. that a formation of cell-membrane takes place within the range of these currents, whilst absorption occurs within or without it. On this principle, too, we can better understand the process of the fissiparous division of cells; the endochrome becoming divided into two portions, two centres of electrical force are originated, and each of these giving rise to a set of currents, two cell-membranes are produced instead of the original one. The frequent occurrence of nests of regular crystals (not sand) in the substance of the mucous envelopes of such freshwater genera as *Batrachospermum*, *Chatophora* and *Monormia*, would seem to afford positive proof that electrical currents exist there.

These views, if correct, would of course apply to animal as well as vegetable organisms, and we should be under the necessity of considering the entire membranous or solid portion of the animal as of a subordinate character to the fluids contained in its cells, and merely as an instrument acting in prompt obedience and conformity to the changes taking place in these fluids.

But treating the subject of the functions of the cell-membrane in a chemical point of view, we know that considerable chemical changes are taking place during the processes of assimilation, secretion, elaboration, &c.; that these are essentially chemical phenomena. Are we to look to an organ of such a low chemical constitution as cell-membrane as likely to give origin or the initiative to these important changes? I cannot believe such can be the fact, but that the organ or substance which gives

a start, as it were, to these phenomena, will be found to be one in which rapid chemical change is taking place; one, which, under the influence of light, &c. acting upon substances brought into contact with it, brings about a change in these; these changes again reacting upon itself. I cannot help believing that such will prove to be the explanation of the various phenomena of animal and vegetable growth. On a chemical difference in the constitution of this primary organ,—a difference not likely ever to be appreciable by chemists, any more than microscopists will ever be able to discern the ultimate atoms of bodies,—may possibly depend the endless variety of forms put on by organic nature. From a germ of great external similarity they all alike originate, but that these germs are not really alike is shown by their subsequent behaviour. They have different properties: does not this imply a different constitution? a different chemical constitution?

This view may be supposed by some to involve a belief that a living organism may owe its origin to mere physical circumstance; to an accidental chemical combination; but the very laws of chemistry would suffice to negative such a proposition—*laws* which would prove the impossibility of an adventitious production of such a combination as must be conceived to exist in the primary structure of a living organism. The views I advance would rather furnish an argument in favour of the necessity of there being a First Great Cause, and should raise our ideas of the glorious power of the Creator, who by the employment of one simple law could raise up such an infinite variety of beautiful and interesting forms as living nature presents to our view.

IV.—*Descriptions of some apparently new species of Orthopterous and Homopterous Insects.* By ADAM WHITE, M.E.S., Assistant in the Zoological Department of the British Museum.

[With a Plate.]

Order ORTHOPTERA.

Family LOCUSTINÆ.

Genus ACANTHODIS, Serv.

Locusta (Acanthodis) imperialis, White. Pl. I. f. 1. Head yellow in front, the rest brown. Body of a deep brownish black, shaded with lighter brown below. Thorax nearly as wide as long, comparatively smooth, yellowish green. Elytra somewhat bulging at the base, black and brown, with from three to six small yellowish green subtriangular spots on the outer edge, the greater part of inner margin of a most beautiful green, with three large

angled branches generally reaching the large middle nerve, the outside edges of the green parts fading sometimes to white ; there are some black transverse marks near the base of the elytra. Wings black, most elegantly marked with many short very pale bluish green abbreviated transverse lines, some of these angled ; on the anterior edge are two or three faint whitish spots ; the femora of middle legs and the femora and tibiæ of hind legs are green, in some specimens of a yellowish brown ; tarsi and fore legs blackish brown ; ovipositor yellow, tinged with brown at the end.

Expanse of wings 4 inches 6 lines. Length from head to end of ovipositor 2 inches 9 lines. Length of antennæ 4 inches 8 lines at least.

Hab. Silhet, E. Indies.

The legs are not spiny, and much resemble those of the *Locusta Novæ Hollandiæ*, De Haan, Verh. Nat. Gesch. t. 19. f. 4.

This species, so remarkable for its fine colouring and marking, would appear to be far from rare in Silhet, a country which would seem one of the chief seats of the *Locustidæ*. In the British Museum is an enormous *Pseudophyllus* from that country, which I have called *Pseudophyllus Titan*. The elytra green, somewhat veined with yellow ; near the base there are two small ocelli ringed with green, reddish and brown ; the wings are clear and veined with green ; the thorax has somewhat serrato-spinose edges, except immediately in front ; on the middle of its dorsal surface are many short thickish spines, and two deepish transverse grooves ; the middle and hind legs are very strongly spined, the fore ones less so.

Expanse of wings 8 inches 6 lines ; of the elytra at least 9 inches ; the neuration of the wings and other characters may entitle it to generic distinction.

HOMOPTERA.

APHANA, Guérin.

Aphana Confucius, White. Elytra of a light brownish ochre, thickly sprinkled with black dots and small marks, irregular in size ; black dots on the anterior margin ; a small whitish spot on the posterior margin near the end. Wings ochrey orange, deep red, close to the body, largely tipped at the end with black, the posterior margin edged narrowly with dusky, twelve to fourteen black spots on that part of the wing next the body, a few pale spots on the other ochrey-coloured part. Tibiæ of fore and middle legs blackish, with two pale rings ; hind legs palish yellow, the tibiæ on the outside with five spines. Head and thorax brownish ochre. Abdomen above vermilion-red.

Expanse of elytra 1 inch $8\frac{1}{2}$ lines.

Hab. China. In the collection of the British Museum ; sent by the late George Tradescant Lay, Esq.

This very prettily marked species is in the same section with *A. variegata*, Guérin, and *A. atomaria*, Fabr., to both of which, but especially to the former, it is allied.

PARALYSTRA, *White.*

A very marked genus not far removed from *Calyptoproctus*, Spinola (Ann. Soc. Ent. Paris, viii. p. 269) ; but it differs from that in the much larger size of the terminal abdominal plate, which is longitudinally three-keeled above, in the margin of the head above the eyes being elevated and pointed behind, the eyes in some views almost concealed by this margin ; the vertex is more or less hollowed out ; the thorax projects in front, and behind is sinuated ; the sides of the dorsal part are raised ; on each side of the back there is a deep depression. The clytra on the fore margin differ from the clytra in *Lystra* and *Calyptoproctus* in being rounded and then slightly sinuated beyond the middle, as well as in being differently reticulated ; the veins of the wings more nearly approach those of the genus *Lystra* than *Calyptoproctus*, the veins of which are more reticulated.

Paralystra Emma, White. Pl. I. f. 2. Elytra of a very pale ochrey gray, transversely vermiculated and delicately lined with black ; base darkish green, as is an indistinct band close to the base. Wings pale bluish white, with some greenish longitudinal band-like marks near the base, contrasting well with the nerves, which are of a deep blackish brown, and have the sides at the base tinged with brown. The head and thorax are of a mixed gray, ochrey brown and green colour ; there are two small tufts with greenish-tipped filaments, one on each side of metathoracic segment (?) above ; the abdominal plate is for the most part of a fine rich orange-yellow.

Expanse of elytra $3\frac{1}{2}$ inches.

Hab. Brazil (found in the street of Para). In the British Museum, to which it was presented by Mr. and Mrs. J. P. George Smith of Liverpool, with very many other rare and new insects collected during their residence in Brazil ; the specific name is given in compliment to Mrs. Smith, as a trifling testimony of the estimation in which I hold her discernment as a naturalist.

PÆCILOPTERA, *Latr.*

Pæciloptera Maria, White. Pl. I. f. 3. Of a very delicate white colour, with a roundish red wax-like spot not far from the base of clytra, an interrupted somewhat curved narrow black line running across the wing, not reaching the fore margin ; behind it and not far from the end of inner margin there is a short narrow black

line; the elytra more or less powdered with a waxy secretion; the wing white, somewhat hyaline; head, thorax, body and femora very pale yellow; the antennæ and tibiæ blackish; large tuft of white waxy sponge-like matter at the end of body.

Expanse of elytra about 1 inch and 4 lines. Brit. Mus.

Hab. India (Silhet). In some specimens the red mark on the elytra is nearly obsolete, and the transverse black line is quite obsolete anteriorly.

Paciloptera (Flatida) tricolor, White. Elytra pale green; anterior margin, especially at the base, reddish, the colour gradually verging into green; a few white powdery dots on the basal half, the under side washed with white. Wing white, somewhat powdered, the veins, especially at the base, greenish. Body and legs pale green.

Expanse of elytra about 1 inch 11 lines.

Hab. India (Silhet).

The front edge of wings near the base has a prominent angle, followed by a sinuation.

June 1846.

V.—*Remarks on certain Genera belonging to the Class Palliobranchiata.* By WILLIAM KING, Curator of the Museum of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne.

THE greatest discordancy of opinion has for some time prevailed with regard to the nomenclature and value of certain generic groups of the Palliobranchiate or Brachiopodous mollusks. A few years since, many palæontologists united such shells as *Leptæna rugosa* and *Productus Martini* in one group, to which they gave the latter generic name: J. De C. Sowerby* and Professor Phillips† recognise the same association; but they discard the term *Productus* and adopt that of *Leptæna*: M. Bronn in the 'Lethæa Geognostica' agrees to the same union, but he rejects both names, and uses that of *Strophomena*. M. de Verneuil groups *Terebratula sacculus*, *Spirifer ambiguus* and *Atrypa reticularis* in one genus—*Terebratula*‡; J. De C. Sowerby would be disposed to make two genera of them; while Professor Phillips would have little hesitation in separating them into three. Bronn unites *Orthis testudinaria* and *Spirifer speciosus* under the genus *Trigonotreta*. Conrad and other American writers reject the generic name, which on this side of the Atlantic is applied to such shells as *Leptæna rugosa* and *L. euglypha*, and adopt for the same that of *Strophomena*. And Mr. M'Coy has been led to im-

* Silurian System, &c.

† Palæozoic Fossils of Cornwall, &c.

‡ Russia in Europe.

pose a new generic nomenclature in several cases where there are already too many synonyms.

But although this state of things exists, there is every reason for believing, from the progress which fossil conchology has made of late, that it is gradually passing to a termination: thus Professor Phillips has happily proposed *Hypothyris* for an extensive division of shells which have long complicated the genus *Terebratula*. Von Buch* and a few others have judiciously restricted *Productus* to those shells agreeing with the one (*P. Martini*) which Mr. James Sowerby considered as typical of the genus. M'Coy has succeeded in establishing the genus *Martinia* for a number of forms that have been successively, but never satisfactorily placed in *Terebratula*, *Atrypa* and *Spirifer*. Koninck has skilfully cleared up Fischer de Waldheim's genus *Chonetes*. Verneuil, besides considerably advancing our knowledge of every palaeozoic genus of the class, has clearly shown that the Orthises have no congeneric relationship to certain recent and tertiary *Terebratulas* as supposed by Philippi and others. And J. De C. Sowerby has done much towards unravelling the genus *Atrypa*.

In drawing up the remarks contained in this paper, though it is certain that many errors will be committed by myself, yet I hope to contribute something towards elucidating a subject involving many difficulties.

Before proceeding further, it is necessary to state, that as regards the nomenclature of the various genera to be alluded to, it is my intention to give preference to those names which are the earliest on record, however much the groups to which they were originally applied have been divided or enlarged, and provided they are not decidedly objectionable: it will therefore be at once understood, that I intend adopting the names *Terebratula*, *Productus*, *Spirifer*†, *Pentamerus*, *Strophomena*, *Leptæna*, *Atrypa*, *Chonetes*, &c. in preference to their substitutes *Epithyris*, *Trigonotreta*, *Delthyris*, *Cyrtia*, *Cleiothyris*, *Athyris*, *Leptagonia*, &c.

Having made these preliminary observations, I now proceed to give a synopsis of the various genera composing the class *Palliobranchiata* as far as I think is warranted by our present knowledge of the subject, after which I shall commence with my proposed remarks on certain of these genera.

* Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin, 1841.

† In the 'Geology of Russia' (vol. ii. p. 40) M. Verneuil states that M. Fischer had the honour of being the first to separate from the *Terebratulas*, under the name *Choristites*, the shells which are now called *Spirifers*. The genus *Spirifer* was proposed in 1815, but *Choristites* does not appear to have been published prior to 1825.

Synoptical Table of the Genera composing the Class Pallio-branchiata.

<i>Families.</i>	<i>Genera.</i>	<i>Characteristic Species.</i>
Obolidæ	Obolus, <i>Fichw.</i>	Apollinis, Ingricus, &c.
Lingulidæ	Lingula, <i>Brug.</i>	anatina, Lewisi, antiqua, &c.
Orbiculidæ ...	Orbicula, <i>Lam.</i>	lamellosa, Buchii, &c.
Craniidæ	Crania, <i>Retz.</i>	anomala, <i>Müll.</i> ; spinulosa, striata, antiquissima, nummulus, antiqua, costata, &c.
	Siphonotreta, <i>Vern.</i>	unguiculata, verrucosa.
Calceolidæ ...	Calceola, <i>Lam.</i>	sandalina.
Strophomenidæ	Strophomena, <i>Raf.</i>	rugosa, <i>Raf.</i> ; alternata, oblonga, euglypha, Dutertii, Ouralensis, transversalis, Humboldti, imbrex, Fischeri, lepis, sericea, nasuta.
	Orthis, <i>Dalm.</i>	Pecten, eximia, crenistria, resupinata, Michelini, adscendens, anomala, zonata, calligramma, senilis, Verneuli, semicircularis, moneta, &c.
	Leptæna, <i>Dalm.</i> ..	rugosa, <i>Hising.</i> ; analoga, distorta, depressa ; ? intermedia, <i>M'Coy</i> ; undulata, nodulosa.
	Chonetes, <i>Fisch.</i> ..	sarcinulata, papilionacea, minuta, volva, <i>M'Coy.</i>
Productidæ ...	Productus, <i>Sow.</i> ..	Martini, giganteus, punctatus, costatus, proboscideus, comoides, plicatilis, Nystianus.
	Strophalosia, <i>nobis.</i> ..	spinifera, <i>nob.</i> ; Morrisiana, <i>nob.</i> ; subaculeata, <i>Murch.</i> ; horrescens, <i>Vern.</i> ; productoides, <i>Murch.</i> ; ? spinulosa ; <i>Gerardi, nob.</i> , &c.
Terebratulidæ	Terebratula, <i>Lwyd.</i>	vitrea, sanguinea, Sowerbyi, Chilensis, dorsata, Natalensis, caput-serpentis, rosea, truncata, sacculus, hastata, orbicularis, oblonga, digona, obovata, variabilis, <i>Sow.</i> ; longirostris, &c.
	Hypothyris, <i>Phill.</i>	cuboides, anisodonta, pugnus, acuminata, Meyendorfi, Wilsoni, inconstans, plicatilis, psittacea, pleurodon, decussata, Voltzii, rostrata, excavata, obsoleta, &c.
	Pentamerus, <i>Sow.</i> ..	Knightii, conchidium, lævis, galeatus, Bashkiricus, oblongus, borealis, &c.
	Camerophoria, <i>nob.</i>	Schlotheimi, superstes, multiplicata, <i>nob.</i> ; globulina, <i>Phill.</i>
	Uncites, <i>DeFr.</i>	Gryphus.
Spiriferidæ ..	Spirifer, <i>Sow.</i>	cuspidatus, Mosquensis, speciosus, heteroclitus, cheiropteryx, cristatus, Walcottii, trapezoidalis, cardiospermiformis, lynx, rotundatus, planatus, trigonalis, &c.

Families.	Genera.	Characteristic Species.
Spiriferidæ ... (continued).	<i>Atrypa</i> , <i>Dalm.</i>	<i>reticularis</i> , <i>desquamata</i> , <i>prunum</i> , <i>tumida</i> , <i>concentrica</i> , <i>pectinifera</i> , <i>lamellosa</i> , <i>expansa</i> , <i>fimbriata</i> , <i>planosulcata</i> , <i>Helmersenii</i> , <i>am-</i> <i>bigua</i> , ? <i>Mantiæ</i> , ? <i>serpentina</i> , <i>le-</i> <i>pida</i> , <i>fenita</i> , &c.
	<i>Martinia</i> , <i>McCoy</i> ...	<i>glabra</i> , <i>rostrata</i> , <i>Schl.</i> not <i>Zeiten</i> ; <i>hyalina</i> , <i>lineata</i> , <i>lævigata</i> , <i>strigo-</i> <i>cephaloides</i> , <i>pachyrhynchus</i> , <i>lab-</i> <i>bellum</i> , &c.
	<i>Strigocephalus</i> , <i>Defr.</i>	<i>Burtini</i> , <i>dorsalis</i> , &c.
Thecideidæ ...	<i>Thecidea</i> , <i>Defr.</i> ...	<i>Mediterranea</i> , <i>recurvirostris</i> , <i>ra-</i> <i>diata</i> , <i>hippocrepis</i> , <i>hieroglyphica</i> , &c.

Respecting the generic arrangement adopted in the foregoing table, it requires to be mentioned that I do not claim any consideration for its being a natural one. My opinion is that no linear arrangement can represent the true relationship pervading the various genera of any class of animated nature. On this subject I have elsewhere offered my views*, and it is my intention shortly to extend the same to a classification of the mollusks under consideration.

ATRYPA, &c.

Many palæontologists are evidently unwilling to recognise the genus *Atrypa*: Dalman its founder, as is often done, included in it some very different shells, as *Atrypa reticularis*, *A. galeata* and *A. nucella*, inasmuch as the first is furnished with a pair of spiral appendages†, the second possesses the internal structure peculiar to the *Pentamerus*, and the third does not appear to be distinguishable from *Hypothyris*; it therefore follows that the genus requires to be considerably restricted. In this case we must not overlook the species which Dalman first described, viz. *Atrypa reticularis*, Linn., as we are compelled to consider it as the typical one.

As its founder included a variety of forms in *Atrypa*, it is to be expected that others would err in the same manner; thus J. De C. Sowerby‡ includes in it the filose Spirifers of Phillips, and such shells as *Terebratula pugnus*, Sow., &c., which belong to other genera, the former generally to *Orthis* and the latter to *Hypothyris*. Mr. Sowerby has however been more fortunate with such species as *Spirifer expansus*, Phill., and *S. planosulcatus*,

* Vide Annals of Natural History, vol. xiv. pp. 271 and 272.

† DeFrance was the first to make known the presence of these appendages in *Atrypa reticularis*. (Vide *Spirifer Sowerbyi* [= *A. reticularis*] in the 'Dictionnaire des Sciences Naturelles,' tome 50.) I have a specimen from the Eifel exhibiting the same appendages.

‡ Mineral Conchology, No. 108.

Phill., since they agree with the typical species of *Atrypa* in being furnished with spiral appendages.

Without being aware that so important a part as the spiral characterized them, Dalman included in the genus his *Atrypa tumida* and *A. prunum**, both of which in external characters approximate the two species cited at the close of the last paragraph.

M. Verneuil, in merging *Atrypa* into *Terebratula*, has been influenced by an opinion that few will now contend for: he supposes that the spirals found in the shell of the former are the same as the labial processes belonging to the mollusk of the latter†, whereas they are merely the supports of these processes, and therefore homologous with the internal armature of *Terebratula*. The figures which Mr. M'Coy has given of the spiral appendages of *Spirifer*, &c., in the 'Synopsis of the Carboniferous Fossils of Ireland,' p. 127 &c., clearly show that they are attached to the hinge of the imperforate valve, which could not be the case if they had been the labial processes themselves.

The armature of *Terebratula* and the spirals of *Atrypa* having been shown to serve the same office, it may be maintained that this still shows the necessity of discarding the last genus. There would have been some grounds for this if *Atrypa* possessed an internal apparatus as variable as that of *Terebratula*, but considering the constancy of form of the spiral appendages, and their persistency over an extensive number of shells (that is, the *Atrypas* in the present case) related to each other by affinity and geological age, it is impossible to consider them otherwise than as constituting a character which separates the shells under consideration generically from the *Terebratulas*.

Atrypa is distinguished from all the spiral-bearing genera by the general absence of an area ‡ and the frequency of a foramen ;

* I have Swedish specimens of these species exhibiting the spiral coils.

† Geology of Russia, vol. ii. pp. 47, 48, &c.

‡ As several new terms are used in this paper to express various parts of a Palliobranchiate shell, and as several old ones are somewhat differently employed to what they are in general, I embrace the present opportunity of entering into the following explanations:—Palliobranchiate shells generally articulate by means of two teeth or "*condyles*," situated on the hinge of the foraminal or "*dorsal*" valve, and a pair of depressions or "*sockets*" excavated in the corresponding part of the opposite or "*ventral*" valve. The two plates seen in the rostral or umbonal cavity of the *Spirifers*, &c. have been described by Von Buch as "*les lamelles de soutien des dents*," because they are connected with or appear to support the condyles: the expression may therefore be conveniently translated into "*condyle plates*." On the dorsal valve of *Spirifer*, *Leptaena*, *Strophomena*, *Thecidea*, *Martinia*, &c., and in certain species of other genera, as *Terebratula truncata*, *Hypothyris rostrata*, &c., are to be seen two flat spaces, one on the outer side of each of the condyles; these spaces constitute what is generally called the "*area*."

the last character is however variable, even in the same species : thus some varieties of *Atrypa reticularis* from the Eifel have it apical and entire ; others, subapical and entire ; others again have it apical and emarginate ; and others, subapical and emarginate ; even some varieties have a well-defined area. Generally however the foramen is apical and emarginate, being notched inferiorly by an open but concealed deltidium, as in *Atrypa concentrica*, *A. Roissyi*, *A. pectinifera*, *A. prunum*, *A. tumida*, &c.

In all the dentigerous Palliobranchs, a triangular space intervenes between the condyles ; this it is proposed to term the "*deltidium*:" when open, as in certain Spirifers, &c., it may be termed an "*open deltidium*," and when closed or cicatrized, as often occurs, a "*cicatrized deltidium*:" it is "*concealed*" in the *Atrypas* generally, and in certain species of other genera, as *Pentamerus Knightii*, &c. (in consequence of being occupied by the umbone of the ventral valve), and "*exposed*" in the Spirifers, Martinias, Orthises, Leptanas, Strophomenas, &c., and in certain species of other genera, as *Pentamerus conchidium*, *Atrypa ferita*, &c. The part forming a cicatrized deltidium may be named the "*cicatrix*." The umbone of the Terebratulæ is furnished with an aperture which is generally termed the "*foramen*," it is "*apical*" when situated at the point of the beak (*Terebratula dorsata*, &c.), and "*sub-apical*" when placed below the point (*Hypothyris*) : often it is notched inferiorly by an open deltidium, as in *Atrypa Roissyi*, &c., in which case it is an "*emarginate foramen*;" when not in this state it is an "*entire foramen*:" in *Terebratula dorsata* it is "*entire and apical*," in *Hypothyris obsoleta* "*entire and subapical*," in *Atrypa Roissyi* and *Terebratula caput-serpentis* "*emarginate and apical*," and in *Hypothyris psittacea* "*emarginate and sub-apical*." The distinction between a foramen and a deltidium is necessary, as the former in all cases served as a passage for the pedicle ; but the latter, as in some Spirifers, *Hypothyris excavata*, *Pentamerus conchidium*, &c. (which have an open deltidium), only occasionally answered this purpose : when it was necessary for a shell with a cicatrized deltidium to be attached by means of a pedicle, the cicatrix was perforated as exemplified in *Spirifer heteroclitus*, *Orthis adscendens*, &c. : in *Leptæna*, although the deltidium is open, it could not serve as a passage for the pedicle in consequence of being completely occupied by a prominence situated on the hinge of the ventral valve. The condyle sockets are often bounded inwardly by a ridge or wall (hence the name "*socket-wall*") which is occasionally prolonged into the cavity of the shell under the form of a plate, as in *Orthis eximia*, &c. ; to distinguish the two resulting plates from those of the dorsal valve, it will be convenient to name them "*socket-plates*." Besides being occasionally prolonged, the socket-walls are generally expanded laterally under a lamellar form ; occasionally these lateral expansions remain separated (*Terebratula variabilis*), but in general they are connate (*Terebratula dorsata*, *Hypothyris rostrata*, &c.) and form a single plate ; as this plate generally serves as the base of the "*crura of the loop*" (Owen), it is proposed to term it the "*crural base*:" it is "*concave*" in *Terebratula dorsata*, "*flat*" in *Hypothyris rostrata*, and "*divided*" in *Terebratula variabilis*. The crural base is often supported by a plate extending along the medio-longitudinal line of the shell ; the dorsal valve occasionally possesses a similarly situated plate : both may be termed individually a "*crural plate*." Care must be taken not to confound the socket-plates with two ridges to be seen diverging from the centre of the hinge and traversing the muscular impressions in certain shells (*Orthis Verneuli*, &c.) : these appear to have been produced by two large vessels belonging to the vascular system of the mollusk.

In the synoptical table the genera *Spirifer*, *Martinia*, *Atrypa* and *Strigocephalus* are grouped under the family *Spiriferidae*. By restricting the family to these genera, I am led to believe that no point is involved that can in any respect embarrass a natural classification of the great class to which it belongs; at the same time, there is little doubt that it forms a remarkably homogeneous group, inasmuch as its species, there is every reason for supposing, were tenanted by a mollusk furnished with labial processes that were immovably fixed to a pair of spirally folded supports. This character of the labial processes is fully warranted by the recent *Terebratulas*, in which the same parts are immovably fixed to a more or less complicated loop. The spiral form of the labial processes, their immobility, and their spirally folded supports, are characters which eminently distinguish *Spiriferidae* from every other Pallobranchiate family.

The spiral-bearing shells are found under so many different forms as to have induced some to arrange them under a number of genera, but I am led to believe that the principal part of them are inadmissible, having been founded on characters highly fugacious, or transitional, and proposed without a due consideration of the claims of previous writers: thus *Cyrtia* was not only based on a highly mutable character, but it was anticipated by *Spirifer*, the typical species of which (*S. cuspidatus*) possesses the same characters as *Cyrtia trapezoidalis*—the type of Dalman's genus. *Delthyris* and *Trigonotreta* are equally inadmissible on the same grounds. *Brachythyrus*, M'Coy, has been anticipated by *Choristites*, Fischer, which is founded on too transitional a character. *Actinoconchus*, M'Coy, if admitted, would render necessary the separation into so many genera, of such shells as *Atrypa planosulcata*, *A. pectinifera*, *A. fimbriata*, *A. Roissyi*, *A. reticularis* and *A. aspera*, because their marginal plates are severally planosulcated, pectinated, fimbriate, setigerous, flounced, &c. And as regards *Athyris*, M'Coy, and *Cleiothyris*, Phill., they have been anticipated by *Atrypa*, whose name, notwithstanding its being in several cases a misnomer, ought not on that account I conceive to be now discarded. Certain objections might be urged against the genus *Martinia* of M'Coy, but they do not appear to be sufficiently strong to prevent its adoption; by its possessing an area and an exposed deltidium, *Martinia* may be readily distinguished from *Atrypa*—the genus with which it stands the most chance of being confounded. *Reticularia*, M'Coy, does not appear to possess characters sufficient to warrant its separation from *Martinia*.

TEREBRATULA and HYPOTHYRIS.

Mr. James Sowerby was the first to draw a distinction between

the smooth and the plicated *Terebratulas**. Afterwards M. von Buch, in his memoir 'Über die Terebrateln,' on account of the same difference, divided them into the two divisions "*Plicata*" and "*Non-plicata*." Still later, Professor Phillips, in his 'Palæozoic Fossils of Cornwall,' &c., elevated the *Terebratulas* to the rank of a family under the name *Cyclothyridæ*, which includes two genera, *Epithyris* and *Hypothyris*, the former having the "beak truncate, perforate," and the latter the "beak acute, the perforation below it." *Hypothyris* agrees with the plicated and *Epithyris* with the non-plicated divisions of Sowerby and Von Buch. More recently, Mr. M'Coy, in the 'Synopsis of the Mountain Limestone Fossils of Ireland,' has divided the family *Terebratulide* into five genera, *Atrypa*, *Semiluna*, *Delthyridæa*, *Cyclothyris* and *Terebratula*: the last two only merit our attention at present, as they correspond with the genera proposed by Professor Phillips. In the same year that Mr. M'Coy's observations appeared, Dr. Carpenter, at the York Meeting of the British Association, read a report "On the Microscopic Structure of Shells," in which the *Terebratulas* are divided into two sections, the "perforated" and the "non-perforated," that is, with reference to the arrangement of the tissues composing the shell: these sections are also in exact correspondence with the two divisions under consideration†.

It will now be evident that the *Terebratulas*, from the year (1815) in which Mr. J. Sowerby's views appeared to the present period, have been grouped under two leading divisions, and that these divisions have been proposed with reference to three sets of characters totally distinct from each other: a stronger proof of the necessity of elevating them to the rank of genera cannot be required.

Before proceeding further, it will be necessary to make a few remarks on the names which have been proposed for the two genera so clearly established. If we agree to those of Professor Phillips, the old name *Terebratula* will be expunged from conchology: this I am strongly disposed to think will scarcely be sanctioned: I am therefore induced to prefer it to the proposed substitute *Epithyris*. It is now difficult to say whether the name *Terebratula* was first applied to the smooth or the plicated spe-

* Mineral Conchology, vol. i. p. 189.

† There seems to be an error in Dr. Carpenter's list of "non-perforated" species, as it contains *Terebratula variabilis* (of Sowerby, not of Schlotheim I presume), which, judging of its form, &c., appears to belong to the perforate division: this is in a great measure proved by the fact, that the same shell is represented in the illustrations with a perforate tissue (vide Report of the British Association for 1844, plate 17. fig. 39). Has not a similar mistake occurred with *Terebratula subrotunda*?

cies, but as the former are those first described by Bruguière, Lamarck and others, I am led to think that its retention for them will meet with general approval. Respecting the names *Hypothyris*, Phill., and *Cyclothyris*, M'Coy, for the plicated species, the former having the priority ought to have the preference.

My next object will be to attempt to define the limits of the genera *Terebratula* and *Hypothyris*. Besides the smoothness or plication of the valves, the apical or subapical position of the foramen, and the perforate or imperforate texture of the shell, there are other characters which appear to be generally useful in distinguishing these genera; thus the species of *Hypothyris* may in general be distinguished from those of *Terebratula* by the greater or less sinuosity of their frontal margins. In the synoptical table, *Terebratula psittacea* is placed in *Hypothyris* from its possessing an acute apex, a subapical foramen, and an imperforate shell-tissue: this species suggests the probable existence of other distinguishing characters; for example, in *Hypothyris* the internal apparatus may be simple, and the labial appendages of the mollusk attached only at their base: judging of existing *Terebratulas*, the latter are attached nearly throughout their entire length to a complicated apparatus. We are not yet in a position to urge these differences with any degree of certainty, particularly with respect to the labial processes, since, of the genus *Hypothyris*, the animal of only a single species (*H. psittacea*) is known; and as regards the apparatus, we are still but imperfectly acquainted with its structure in the fossil species of either genera. In *Hypothyris* the armature appears to be exceedingly simple, consisting only of two disunited processes passing from the hinge of the imperforate valve into the cavity of the shell; but in *Terebratula* these processes are united anteriorly, thereby forming a loop, which is more or less folded and complicated according to species*. Much care is required in ascertaining whether the disunited processes and the loop are really distinguishing characters in these genera, since in fossil species the latter may be broken in such a manner as simply to exhibit its two *crura*, which will then resemble the former. M. Verneuil has evidently been misled by a circumstance of this kind in representing *Terebratula elongata* with disunited processes†, as several specimens of this species in my collection clearly exhibit it furnished with a folded loop; and I suspect that Mr. M'Coy has been similarly deceived in stating

* In *Terebratula dorsata* the loop is simply attached to the crural base; in *T. chilensis* it is attached both to the crural base and to the anterior part of the mesial plate; in *T. rosea* it is only attached to the mesial plate. The apparatus of the last species explains the erect forked process seen in the centre of the ventral valve of *T. natalensis*.

† Geology of Russia, vol. ii.

that *Terebratula hastata* possesses "two flat triangular laminæ*." Finding the loop in the existing *Terebratulas* in the Permian *T. elongata* goes far to prove that it is general in the genus. I have also seen it in the Jurassic *Terebratula trilineata* collected in Glazedale, Yorkshire.

As might be expected, there are several species which it is difficult to place in their true genus; but where so many characters are available, some, or one at least, may be found to assist us. *Hypothyris decussata* (*T. coarctata*, Sow.), in consequence of having the "beak truncate, perforate," one would be disposed to place it in *Terebratula*; but as Dr. Carpenter has ascertained that its shell-tissue does not exhibit any perforations, it has on that account been placed in *Hypothyris*. *Terebratula truncata* has a subapical foramen, and therefore might be included in *Hypothyris*, but this is strongly opposed by its possessing a loop and by the texture of its shell. *Hypothyris psittacea*, from the absence of decided plications, would not have been thus generically designated, but for its subapical foramen and imperforate shell-tissue†. *Hypothyris Meyendorfi* appears to have a truncate, perforate beak, but its deep frontal sinus and its indisputable affinity (another point not to be overlooked) to *H. acuminatus* and *H. pugnus*, in which the foramen is subapical, are clearly in favour of the generic allocation adopted in the synoptical table. A few more species remain to be noticed, viz. *Terebratula oblonga*, *T. orbicularis* and the so-called *T. rostrata*: all of them have the plicated character of *Hypothyris* joined to the form usual to *Terebratula*; but the apical foramen of *T. oblonga* and *T. orbicularis* proves that they are true *Terebratulas*, while the subapical position of the foramen in *T. rostrata* shows that it belongs to *Hypothyris*: in the case of two of these species this generic allocation is completely confirmed by the researches of Dr. Carpenter, who has ascertained that *T. oblonga* possesses a perforate and *T. rostrata* an imperforate shell-tissue.

In speaking of the internal structure of *Terebratula* and *Hypothyris*, I have refrained from alluding to the two condyle plates to be seen in the rostral cavity of certain species, for this reason, that they are found in both genera, though not so frequently in

* Synopsis of the Carboniferous Fossils of Ireland, p. 153.

† *Hypothyris psittacea* has occasionally been suggested to belong to *Atrypa*: by restricting this genus to the spiral-bearing shells included in it in the synopsis, *Hypothyris psittacea* will necessarily be excluded. The difference between the mollusk of the one and that of the other appears to have been considerable, since in *Atrypa* the labial appendages were in all probability completely attached to spiral supports and therefore immobile; but in *H. psittacea*, notwithstanding their spiral form, they undoubtedly possess considerable motion. [Vide Professor Owen's Memoir on the Anatomy of the Brachiopoda, Zoological Transactions, vol. i. p. 150.]

the former as in the latter. They do not appear to have been noticed in any tertiary and recent Terebratulas: they are to be seen in *Terebratula digona*, *T. obovata* and *T. oblonga*, but are absent in many others agreeing with them in geological age, from which I am led to believe that they are only partially present in the secondary Terebratulas: they appear however to be general to the palæozoic species. With some exceptions, as in certain cretaceous and other species, the condyle plates are to be found in all the Hypothyris living and extinct.

In addition to those given in the synoptical table, the family *Terebratulidæ* has been made to include other genera, as *Trigonosenus*, König, *Rynchora*, Dalman, *Magas*, Sowerby, *Pygope*, Link, *Delthyridæ*, M'Coy, *Semiluna*, &c. As I am not sufficiently acquainted with secondary species to pass an opinion on these groups, I will leave to others better qualified than myself the task of analysing them. The genus *Semiluna*, M'Coy, I am strongly disposed to think is founded on young Hypothyris.

STROPHOMENA and LEPTÆNA.

It is now a generally received rule that "the name originally given by the founder of a group or the describer of a species should be permanently retained to the exclusion of all subsequent synonyms*." This is especially applicable to a group of Pallio-branches next to be considered.

Many years ago Rafinesque proposed the genus *Strophomena*: I do not know the exact time of its publication, but for a certainty it was previously to 1825, as Blainville adopted it in his 'Manuel de Malacologie,' published in that year. The genus is thus described by Blainville:—"Coquille équilatérale, régulière, subéquivalve; ayant une valve plate et l'autre un peu excavée; articulation droite, transverse, offrant à droite et à gauche d'une subéchancrure médiane, un bourrelet peu considérable, crénelé ou denté transversalement; aucun indice de support." The illustrative species (*Strophomena rugosa*, Raf.) figured in the 'Malacologie' is evidently closely allied to and congeneric with *Leptæna alternata*.

Subsequently to Rafinesque, Dalman (in 1827) proposed a new genus under the name of *Leptæna*, in which he included the so-called *Leptæna rugosa*, *L. depressa*, *L. transversalis* and *L. euglypha*, which have generally been considered to belong to the same genus as *Strophomena rugosa*. It is thus evident that the name *Strophomena* has the priority over that of *Leptæna*, which is the reason, it may be presumed, why so many continental and

* Report on Zoological Nomenclature, British Association Report for 1842.

American writers prefer Rafinesque's to Dalman's. Be this as it may, it is not my intention to adopt the one in preference to the other, as it is my opinion that both names can be advantageously retained.

The genus *Leptæna*, as constructed by Dalman, evidently includes two different groups of species, *Leptæna depressa* and *L. rugosa* constituting the one, *L. transversalis* and *L. euglypha* the other. These were the only species known to Dalman; since his time several others of both divisions have been discovered.

It is now difficult to say which species Rafinesque considered as typical of his genus; our only alternative is then to ascertain the type of Dalman's. The committee to whose labours I have already been indebted, state, that "when authors omit pointing out the type of the genus, it may still in many cases be correctly inferred that the first species mentioned on their list, if found accurately to agree with their definition, was regarded by them as the type*." As *Leptæna rugosa* answers in every respect to these terms, it follows that this species ought to be regarded as the type of the genus; and considering the claims which Rafinesque's name has to priority, we are to a certain extent warranted in applying the name *Strophomena* to the group represented by *Leptæna transversalis* and *L. euglypha*†.

It will now be necessary to point out the differences between *Leptæna* and *Strophomena*. Both valves of *Leptæna* are more or less wrinkled transversely: when the shell is young they are flat; afterwards their frontal margin becomes inflected, which is permanent in the dorsal or deltidial valve, but evanescent in the opposite one, as its front soon becomes acutely deflected or folded upon itself outwardly: by this means the frontal margins do not meet each other, as in the Terebratulæ, and as they at first affected, but the anterior part of the upper valve overlaps that of the under one, the inner surface of the one facing that of the other at the same time. On the other hand, *Strophomena* has plain valves, that is with reference to the wrinkles, and it is in general regularly concavo-convex‡, the convexity usually

* Report of the British Association for 1842, p. 111.

† If it cannot be ascertained which species Rafinesque considered as the type of *Strophomena*, the *S. rugosa* figured in Blainville's 'Malacologie' ought to be looked upon as the typical one; and in this case we are bound to adopt Rafinesque's name, inasmuch as this species belongs to the group represented by *Leptæna transversalis* and *L. euglypha*.

‡ *Strophomena* and *Orthis* merge into each other by means of their flat species. Fischer de Waldheim, in proposing the genus *Orthotetes*, has evidently had in view some of these merging forms; but the fact of Dalman's typical species of *Orthis* (*O. pecten*) being also apparently the type of Fischer's, the former genus necessarily falls to the ground. What is the genus *Hipparionyx* of Vanuxem?

answering to the deltidial valve*. There are one or two more differential characters which ought not to be overlooked in drawing up a *diagnosis* of these genera: for example, in *Leptæna* the deltidium is open and wide at the base, but in *Strophomena* it is usually narrow and cicatrized; and the hinge plates are often crenulated in the latter but generally smooth in the former†. As regards internal characters, they appear to be more inconstant in *Strophomena* than in *Leptæna*: *Strophomena Dutertii* has the muscular fulcræ of the ventral valve elevated, curving over the mesial plate and united, by which means they form an arch-shaped process‡; while in *S. deltoidea* they are reduced to mere impressions: in *S. lepis* the fulcræ of both valves are slightly elevated, and resemble those of *Chonetes*: certain species, as *S. transversalis*, *S. Humboldti* and *S. oblonga*, have lateral (? ovarian) spaces, one or more on each side of the mesial line, bounded by a prominent ridge, as occasionally seen, though less obviously, in *Chonetes*; but in most of the genus there is no appearance of a bounding ridge: in general the vascular system has not left any impressions on the inner surface of the valves,—the exception, as far as I have been able to ascertain, occurs only in *Strophomena lepis*, which in this respect resembles the *Leptænas* generally. The very converse of this mutability of internal structure prevails in *Leptæna*, the species of which are remarkable for the similarity of their muscular fulcræ, for generally exhibiting impressions of the vascular system, and for the general absence of ovarian (?) bounding ridges. Some of the *Leptænas* arrest our attention by their being foraminated; that is, besides possessing an open deltidium, they are furnished with a circular opening in their slightly prominent beak. I possess several specimens of a species, apparently the same as *Leptæna analoga*, from the carboniferous shales of Northumberland, exhibiting the foramen in a very obvious manner; whether it is general to the genus I cannot say. My Swedish specimens of *Leptæna rugosa* do not appear to possess this character, but it is seen in an allied species from the Eifel. *Strophomena alternata* possesses a similar opening, which is the only instance in this genus that has been made known§; but it does not appear to be

* I know of only one exception, which obtains in *Strophomena euglypha*: in this species the deltidial valve is the concave one. The like exception probably occurs in *Orthis*, since *O. crenistria* and some other species have the same valve affecting the concave form.

† *Leptæna nodulosa*, Phillips, has crenulated hinge plates.

‡ This at least is the view I formed from a hasty examination of this singular apophysis in a specimen belonging to the beautiful collection of Mr. W. A. Lewis of Wolverhampton. I have specimens of *Productus Martini* and *Leptæna analoga* (?), in which the muscular fulcræ are unusually elevated and curved over the mesial plate, but they do not coalesce as in *Strophomena Dutertii*.

§ Geology of Russia, vol. ii. p. 225, &c.

situated as in *Leptæna*, in the beak itself, but in the apex of the cicatrix of the deltidium: in this respect *Strophomena alternata* corresponds with *Orthis anomala* and *Spirifer heteroclitus*. The foramen in *Leptæna analoga* becomes closed in old individuals, as occasionally occurs in *Terebratula*.

It is highly in favour of there being a valid generic distinction between *Strophomena* and *Leptæna*, when, out of a large number of species at present known, there is little difficulty in placing them either in the one genus or the other. Though I am not aware of it being the case, it is nevertheless probable that species will yet be found rendering a generic allocation a matter of some difficulty.

Previously to entering upon the next genera to be noticed, it will be necessary to make a few remarks on the muscular system of *Terebratula*, in order that the use of certain parts to be mentioned hereafter may be properly understood. From a specimen of *Terebratula dorsata*, at present before me, containing the entire muscular system desiccated, and freed of the visceral mass, I have drawn up the following details:—The rostral or umbonal cavity is occupied with a dense fibrous cylindrical body called the *pedicle*: considering the convexity of the foraminal valve as the upper side of the shell, the inferior end of the pedicle fits into the foramen; while its superior end, which is somewhat flattened or dilated in the transverse direction of the shell, is situated at the entrance or anterior part of the rostral cavity, to the surface of which it appears to be attached by means of tendinous or membranous chords,—the truncated extremity of the pedicle itself not being adherent. A little in advance of the upper extremity of the pedicle, three pairs of muscles pass off to different parts. The outermost pair (which consists of those muscles implanted nearest the lateral margins of the valve) passes at a slight angle into the upper part of the pedicle: within these muscles, and somewhat in front of them, another pair passes downwards (slightly converging at the same time), and becomes attached to a flattened prominence situated in the centre of the hinge of the lower or imperforate valve. To distinguish these pairs of muscles from each other, it will be necessary to name the former the *superior pedicle muscles*, and the latter the *cardinal muscles*. In close proximity to the superior end of the pedicle, and a little behind, and within the cardinal muscles, and therefore near the medio-longitudinal line of the shell, is situated the origin of the remaining pair, which passes directly down to a little behind the centre of the opposite valve, each muscle at the same time becoming dichotomous in its inferior half: these may be termed the *valvular muscles*. Besides supporting the cardinals and the

valvulars, the imperforate valve affords attachment to other two muscles which pass upwards from the *crural base* (where each one is divided), and become inserted in the upper part of the pedicle: it is proposed to name these the *inferior pedicle muscles*. With one exception, the foregoing description agrees with that given by Professor Owen in his memoir "On the Anatomy of the Brachiopoda*," in which it is stated, that the muscles which have been termed the valvulars pass into the upper part of the pedicle, —a statement which I am led to suspect may have arisen simply from the superior termination of these muscles in the specimens examined by this distinguished anatomist having been so close to the upper part of the pedicle as to appear as if attached to it.

PRODUCTUS, &c.

An examination of a number of Palliobranchiate fossils has convinced me that a muscular system similar to that of *Terebratula dorsata* characterized the genera *Productus*, *Leptana*, *Strophomena*, *Orthis*, *Spirifer* and *Chonetes*. In the deltidial or corresponding valve of these shells, there are impressions answering to the six muscles which have been described as passing from the same valve of *Terebratula dorsata*; and in the opposite valve there are impressions corresponding to the four terminal divisions of the valvulars, and the hinge is generally furnished with a prominence which has clearly served as a fulcrum for the cardinals†. It is necessary to mention that it is only in certain species of these genera that the muscular impressions can be made out; in general they are confluent, in which case it is difficult to define them‡. I have not yet seen any positive indication of impressions in these fossils answering to the two muscles passing from the *crural base* to the upper part of the pedicle: I am strongly disposed however to think that this does not arise from the absence of such muscles, but rather from their not having produced impressions strong enough to remain visible—a supposition that cannot be objected to, considering how very faint the impressions of the inferior pedicle muscles are in *Terebratula*§.

* Transactions of the Zoological Society of London, vol. i. p. 151.

† Those fossils which have no cardinal prominence, as certain *Orthises*, *Spirifers*, &c., have nevertheless impressions in the centre of the hinge, which clearly show that the cardinal muscles were neither abrogated nor implanted elsewhere. *Hypothyris psittacea* serves as an exceptional case in another genus.

‡ In a "Monograph of the Invertebrate Fossils of the Magnesian Limestone of the County of Durham," which I am preparing for publication, a more detailed account will be given of the muscular system, &c. of most of the genera mentioned in the text, together with numerous illustrative figures.

§ In *Orthis Michelinii* the inferior pedicle muscles appear to have been attached to the *socket-walls* or *socket-plates*, as their surface displays marks of muscular attachment.

The whole of the impressions noticed in the last paragraph are best seen in certain *Productus*. The two large striated impressions on the convex valve of *Productus giganteus* I have satisfied myself are due to the superior pedicle muscles*. Within these, and on a flattened elevation, are situated four other impressions curiously ramified; they are often confluent, but occasionally specimens exhibit them separated. Two of these impressions (probably those situated anteriorly) I consider are due to the valvulars, and the other to the cardinals: the former muscles, according to this view, have necessarily produced the ramified impressions generally to be seen on the flat or opposite valve†. The tubercle on the centre of the hinge of the flat valve has commonly been considered a tooth, but the impressions which it displays, and its agreement in position with the cardinal prominence of *Terebratula dorsata*, prove that it served as a muscular fulcrum, and there is every reason to suppose that the cardinal muscles were attached to it‡. M. Bouchard Chanterreaux appears

* The use of the so-called pedicle seems to be twofold—to moor the shell to foreign bodies, and to serve as a fulcrum for certain muscles. In the *Strophomenas* and *Leptænas* generally, owing to the deltidium being cicatrized, or occupied by the base of the cardinal tubercle, the pedicle can only have been used for the latter purpose; in *S. alternata*, *L. analoga*, &c., which have a foramen, it would answer both. The same remark applies to the *Orthises* (*O. anomala*) and *Spirifers* (*S. heteroclitus*, &c.): as the deltidium is often open in the last genus, it appears to have served as a passage for the pedicle. From the closing of the foramen in old individuals of many species of *Terebratula* (*T. variabilis*, *T. carnea*, &c.), *Leptæna* (*L. analoga*), *Hypothyris* and other genera, it is evident that the pedicle was occasionally dispensed with in old age. In young *Strigocéphaluses* the pedicle passed through an open deltidium, as in many *Spirifers*; in individuals more advanced it passed through a circular aperture in the cicatrix of the deltidium (in which case it is an “entire, subapical foramen,” resembling that of many *Hypothyrises*); in full-grown individuals the pedicle was dispensed with, as the deltidium is completely cicatrized. M. Verneuil informs me that the deltidium is exposed and open in young specimens of *Pentamerus Knightii*; it is well known to be concealed in old ones: in another species of the same genus (*P. conchidium*) it is exposed and open. It will thus be evident, although neither foramen nor deltidium is to be seen in *Productus*, that this is no evidence of its having been without a pedicle mass.

† The ramified impressions on the two valves of *Productus* are generally considered to have been produced by the viscera; nor was it until lately, and after seeing that the fibres of the muscles of *Terebratula dorsata* had a ramified arrangement, that I could be induced to think otherwise. The stopper muscle of certain species of *Anomia* produce a similar ramified impression on the upper valve.

‡ M. Verneuil, speaking of *Productus*, says, “La valve ventrale possède une forte dent médiane, quelquefois simple, plus souvent bifurquée ou trifurquée à son extrémité, et représentant les deux ou trois dents des *Orthis* et des *Leptæna* réunies et soudées ensemble.” (Geology of Russia, vol. ii. p. 251.) This so-called tooth, with its bipartite or tripartite extremity, I have never seen fitting into a *correspondingly divided* depression; therefore, irrespectively of the counter-evidence given in the text, this fact alone is sufficient to prove that it is not an articulating instrument.

to be the only one whose view refers the tubercle to the office of a muscular fulcrum ; but he has fallen into an error in supposing that it supported the pedicle or muscle of attachment*.

Before concluding this brief account of the internal characters of *Productus*, we must not overlook its mode of articulation, nor the two crescent-shaped bodies often seen on its flat valve. By some these crescent-shaped bodies are supposed to have been produced by certain muscles ; on the other hand, there are many who think that they have been the supports of the labial processes. From the specimen of *Productus comoides*, which is figured by Von Buch, exhibiting a pair of gyrated impressions† (the same are even more obviously displayed on one of my specimens of *Productus giganteus*), I have no doubt that the mollusk of this genus was furnished with spirally-folded labial appendages : I hope to be able however to show clearly in my monograph, that the crescent-shaped bodies did not support these appendages, but, on the contrary, that they were produced by the ovaries. Respecting the articulation of *Productus*, I have long been convinced that it is effected without the presence of teeth or condyles : by taking the tubercle or cardinal muscular support for an articulating instrument, many paleontologists have described the *Productuses* as dentigerous. I have now examined a number of species, and in every one the hinge plate of the flat valve exhibits nothing but the *cardinal muscular support* ; while that of the opposite valve presents a straight continuous surface, only occasionally broken by a notch caused by the pressure of the part just mentioned‡.

[To be continued.]

VI.—On *Ginnania furcellata*. By GIUS. DE NOTARIS§.

THE celebrated Professor Meneghini, in his excellent work on Mediterranean and Dalmatian Algæ, has justly observed, that the commonest species are often those whose peculiarities of internal structure are, in fact, least known, either because they are supposed to have been already sufficiently illustrated, or because they are regarded, I might almost say, with contempt. Of this number, if I mistake not, is the *Halymenia furcellata* of Agardh, a species common enough on the coasts of England and western France and in some parts of the Mediterranean ; and although

* Annales des Sciences Naturelles, tome xviii.

† Ueber *Productus* oder *Leptæna*.

‡ Certain so-called *Productuses* are known to be dentigerous, but these will be hereafter shown to constitute another genus.

§ Extracted from a paper entitled " Sopra alcune Alghe del mare Ligustico." Communicated by the Rev. M. J. Berkeley.

the points which I have taken upon me to explain may have already been partially noticed by others, they appear to me nevertheless capable of further development and worthy of the renewed attention of algologists.

Most important observations on this species have been given us by Agardh, Greville, Kützing and Montagne, but although these authors have certainly illustrated in a masterly way the form of the frond and fruit, they have not explained the structure with all those details which the present state of algology requires.

The elder Agardh, in his 'Species Algarum' (vol. ii. p. 212), showed that the frond of *Halymenia furcellata* consisted of two strata, the outer one membranaceo-fibrous, the inner one more compact, united closely to the former by means of reticulated fibres, from which the fructification is produced, consisting of minute punctiform tubercles, irregularly scattered and placed beneath the exterior membrane of the frond. *Frons e duplici strato componitur, exteriori membranaceo fibroso; medullari compactiori; utroque per fibras reticulatas conjuncto. Tubercula fructifera per totam frondem irregulariter sparsa, minuta et punctiformia sub membrana exteriori nidulantia.*—Agardh, l. c.

Greville, to whom algology owes so many happy innovations, in his 'Algæ Britannicæ,' pp. 163, 164, says: the fructification, in fact, consists of "minute punctiform globules of seeds imbedded beneath the membranaceous coat of the frond, which is not perforated by any orifice: substance (of the frond) gelatinous and membranaceous, the cavity filled with a pellucid semifluid mass and a fine network of delicate filaments;" as would naturally result from a cord of fine filaments covered with a membranaceous sheath independent of them.

These definitions are too diffuse and incomplete, and their insufficiency is immediately apparent if we contrast them with the descriptions given a short time since by the celebrated D. Zanardini in his 'Synopsis Algarum in Mari Adriatico hucusque detectarum' (Memorie della R. Accademia delle Scienze di Torino, serie 2. tom. iv. p. 124), and by Montagne in his most interesting Cryptogamic Flora of the Canaries (Histoire Naturelle des Iles Canaries, tom. iii. 2ndc partie, p. 162), who, availing himself of the particular characters of the fruit, which I believe he was the first to describe correctly, has proposed to make this species a new genus under the name of *Ginnania*.

The facts which Zanardini mentions would indeed have but slight connexion with the matter before us, having been suggested by the analysis of the frond of the variety *cartilaginea* from the Adriatic (Syn. Alg. &c. l. c.),—which, according to the observations and specimens with which Professor Meneghini has kindly

favoured me, must be referred to *Nemostoma dichotoma*,—were it not that the error into which Zanardini was drawn in considering with Agardh (Spec. Alg. l. c.) *Nemostoma dichotoma* as a variety of *Halymenia furcellata*, proves the close analogy of structure which subsists between the two species in question, and this analogy is of itself sufficient to substantiate the inexactness above alleged.

Neither, in the 'Algæ Maris Mediterranei et Adriatici' (pp. 95, 96) has the celebrated J. Agardh described *Halymenia* with greater precision under the following characters:—*Frons filis interioribus varie intertextis versus superficiem in cellulas rotundatas anastomosantes, extus cellularum granulosarum strato sæpe tectas abeuntibus, constituta. Fructus duplex? Favellidia infra stratum externum nidulantia, frondis dissolutione elabentia (?) intra perisporium arctissime circumdans tenacissimamque congeriem sporarum obovatarum foventia. Spharospore . . .* Terms which are perhaps not quite applicable to all the species of the genus, and still less to our plant, which is scarcely at all indicated. Besides which, a serious omission is to be imputed to him in not having noticed, perhaps deliberately, the observations published on the subject by Montagne; and although I allow that he might not be able to adopt his views, yet at any rate he was bound to cite them, either to discuss their merits or show their inconsistency.

Montagne, as I said before, has described the structure of the fruit with great exactness, which really incloses nuclei composed of slender radiating sporiferous threads. *Nucleus e filis constat articulatis numerosissimis quoquoersum irradiantibus in articulo quorum extremo sporidium oblongum gigartioideumve continetur. Membrana tenerrima tenuissime punctulata, diaphana, ad maturitatem fructus massam filorum investit*; but with regard to the frond, when he says—*intus filamentis constans intricatis, hyalinis, e cellulis periphericis membranæ corticalis, ut videtur, oriundis, vel saltem ad easdem spectantibus*—he either knew not how to draw the characters, or has not expressed himself with the necessary clearness.

Lastly, Kützing in his recent and admirable publication, 'Phycographia Universalis,' has also made *Halymenia furcellata* a new genus with the name of *Myelomium*, defined in the following terms:—*Phycoma filiforme lubricum, dichotomum, solidum, ex stratis tribus formatum, corticale crassiusculo subparenchymatico, intermedio laxe fibroso, medio ex fibris parallelis longitudinalibus numerosis dense conjunctis compositis*. Of the fruit no notice is taken. However censurable such slightly framed generic characters may be from any one, it fills one with astonishment to see how some authors allow themselves to be governed by the mania

for multiplying genera, although they are unable to support them by characters of weight or based on sound principles.

It is hardly necessary to add that the Mediterranean species, the Livornian at least (as well as the Algerine enumerated by the celebrated Montagne in his *Cryptogames Algériennes*, 'Annal. des Scienc. Natur.' 2^{nde} sér. tom. x. p. 257, collected unquestionably by Roussel), is in all parts conformable to the oceanic species, of which I have often received splendid specimens from Lenormand, Godey and Auniet, for which reason I shall dispense with recalling their habits and forms. I will only remark that the frond and its divisions are perfectly cylindrical when first taken out of the water, but wither when exposed to the air, and assume a prismatic triangular or quadrilateral figure, the angles of which are very prominent, the sides depressed and channeled.

At first sight, under the microscope, one would say it was entirely composed of round elliptic or oval cells, whether isolated or ranged above one another in parallel rows; but in vertical as well as horizontal sections, the innumerable filaments which form the central part are easily detected: by taking small slices of the frond in the direction of its greatest diameter and putting them under the microscope, the mode of growth is at once apparent. They thus form a cord, or I might rather say a fascicle, which, like the mealy part of the thallus of some lichens, occupies the centre of the frond, extending even to the furthest divisions. In their course they are repeatedly dichotomous and form two sets of branches, the one directed upwards, the other bent in a horizontal direction, so as to unite by their clavate extremities, which are once or twice divergent and bifurcate, with the peripheric stratum of the frond.

The form of the filaments is rather compressed, the diameter being often unequal and slightly thickened at the commencement of each dichotomy and at their extremities, which inclose a coloured substance, but are themselves diaphanous and completely colourless. In some of them I have been able to determine the presence of lateral branches of various lengths descending in a winding course towards the inferior part of the frond. I also thought I discovered in the filaments, more especially in the points where they became bifurcate, traces of partitions; and I can declare, without hesitation, that the superficial cells, from which the walls of the frond spring, originate from the claviform and divergent extremity of the centrifugal branches. I must not omit to remark, that the cells of the peripheral stratum do not all communicate directly with the horizontal threads; if I am not mistaken, those extremities, in which constrictions frequently occur in the form of articulations, may give rise to new cells, which

being afterwards compressed and ending together in the circumference of the frond assist in strengthening the superficies.

The threads, bent in a horizontal direction, agree closely with the loosely fibrous intermediate stratum of the frond, of which Kützing speaks in his description.

In short, the enlightened Zanardini, when speaking of his *Halymenia furcellata cartilaginea*, has compared its elements to a group of individuals like *Callithamnion* (*Massa inde dimanans haud inconsulto haberetur pluribus generis Callithamnii individuis constituta, quæ ita conservantur atque contexuntur ut quasi majoris implicationis formam affectare vellent*. Zanard. l. c. p. 124), the principal threads of which gathered together constitute the central part; the extremities of their ultimate branches diverging in a horizontal direction, the peripheric stratum. This notion, setting aside the many differences which separate generically the variety from the species, may not without truth be transferred on comparison from the one to the other.

I have also said that the frond of *Ginnania* is something like the thallus of some lichens, because in many of the fruticulose as well as the foliaceous species of this family, I have seen the filaments of the hypothallus often send out communicating branches into the gonimic stratum, from whose apices spring the vegetating cells or gonidia, bearing precisely the same relation as the superficial cells to the filaments which diverge horizontally in the frond as already described.

The fruit, as I have already remarked, arises more or less copiously, without any order, from the internal superficies of the peripheric cellular stratum: its form is spheroidal, without pedicels; it is of a pale rose-colour, visible to the naked eye by translucence through the outer surface. The walls of the frond become thinner where they are in contact with the fruit, but have no perforations of any kind. When slightly pressed between the object-glasses, the fruit opens at the top and emits one, two or more nuclei of a globular form, whose surface is hispid or echinulate. When divided with the point of a lancet they present a complete wood of short and delicate filaments, undivided, bifid or dichotomous, as if united into fascicles radiating from a common centre. These filaments are cylindrical, slightly clavate, and inclose one, two, or at most three nuclei of liquid endochrome, which is slightly olivaceous and separated by diaphanous intervals, in which I have not been able to trace any indication of dissepi-ments.

I dare not assert whether the spores are formed by the successive evolution of the undivided filaments or by the disarticulation and contemporaneous compression of the coloured nucleus con-

tained in them. The spores are obovate, surrounded by a narrow pellucid border, containing a subtle granular substance. The outer coat of the fruit or perisporium which contains the above-described filamentous nuclei is formed of cells, somewhat large, flaccid and elongated, adhering to the membranaceous stratum, transparent and rose-coloured.

I shall conclude by protesting that I do not wish to constitute myself the censor of others, but it appears to me that the characters adopted by Kützing in the formation of the genus *Myelomium* are rather too incomplete, and that the name of *Gimmania*, proposed anteriorly by the excellent Montagne and supported by the strongest arguments, will nevertheless be preferred at the present day, inasmuch as the caprices and partialities of authors ought not to be sanctioned in contravention of the laws generally agreed on by botanists.

VII.—*Descriptions of four apparently new Species of Longicorn Beetles in the Collection of the British Museum.* By ADAM WHITE, M.E.S., Assistant in the Zoological Department of the British Museum.

[With a Plate.]

SAROTHROCERA, White.

ANTENNÆ with the first joint thick, and furnished at the end on the inside with a tuft of hairs; second joint very small, with one or two hairs; third to the seventh joints behind fringed with longish hairs, the hairs on the third and fourth very thickly distributed and extending over a considerable part of the hind edge. Thorax almost as long as wide, the sides nearly parallel, somewhat depressed above, with a short spine on each side. Scutellum somewhat elongated, the sides parallel. Legs with the femora compressed, especially above; the tibiae much compressed, slender at the base, getting thicker towards the middle, and from that to the end wide, with the sides nearly parallel. Tarsi very wide. Elytra strongly angled, almost aculeated on the shoulders, rounded and simple at the end.

This genus in the system comes close to *Cerosterna*, Dej., with which and *Batocera* it has some characters in common.

The species is from Borneo, whence it was sent by Hugh Low, jun., Esq., after whom I have named it.

Sarothrocera Lowii, White. Pl. I. f. 6. Of a rich brown, slightly tinged with ochraceous; the hairs on the antennæ are of a very dark brown or black; the scutellum is of a pale yellow; the base of the elytra is finely verrucose above, the small warts

not extending to the middle, but running further along the outer margin than they do towards the suture.

Length 1 inch $8\frac{1}{2}$ lines. Brit. Mus.

Hab. Borneo. Hugh Low, jun., Esq.

PLECTRODERA, Dej.

Lamia (*Plectrodera*) *quadriteniator*, White. Elytra aculcate at the end, thickly covered with white scales, and with many scattered black impressed points over the upper surface; the base and shoulders with many small black wart-like points; each elytron with two longitudinal, widish ochraceous vittæ, running from the base and getting narrower towards the tip, where they are evanescent; one of these is on the outer edge of elytron, the second between the middle and the suture; the edge of the tibiæ behind and near the tip is clothed with short ochraceous hairs.

Length 1 inch 7 or 8 lines.

Hab. Guayaquil. British Museum. Presented by Dr. Joseph Hooker, R.N.

A species closely allied to the *Lamia vittator*, Fabr. Syst. Eleuth. ii. 297. 76, and figured by Olivier, t. 15. f. 104: the body in the new species is longer, and the elytra are aculeated at the end. The spines on the thorax are not so thick as in the Fabrician species, and the three black bands on the thorax are not so strongly marked; the head is differently marked; the present species wants the wide black band, with a white spot in it on the vertex behind each eye; the abdomen has three or four ochrey band-like spots on each side.

COMPSOSOMA, Serville.

Compsosoma capucinum, White. Pl. I. f. 7. Black: head with a pinkish red band on each of the cheeks. Elytra pinkish red, base with a narrow black band hardly reaching the shoulders; there is a wider transverse black band between the base and the middle, with the margins of the band angled and sinuated, a black band about the middle, not reaching the side of the elytra; the suture lined with black, except at a point before the middle, where it is red; a black mark on each elytron not far from the tip.

Length $6\frac{1}{2}$ lines. Brit. Museum.

Hab. Brazil (Para). Found by J. P. George Smith, Esq., of Liverpool, and by him presented to the National Museum, with many other rare insects. The elytra are shorter and broader about the middle than in *C. mutillarum*, Serv.; *C. perpulchrum*, Vigors, Zool. Journ. i. 418. t. 15. f. 9 (*C. posticum*, Dej. Cat. 369), *C. scutigerum*, Vigors (*concretum*, Dej. 369. Blanch. D'Orb. l'Am. MÉR. t. 22. f. 8), and *C. notatum*, Vigors, Zool. Journ. i. 417. t. 15. f. 8. The *C. variegatum*, Serv., in form approaches more

closely to the *Eusphærium purpureum*, Newman, Ent. Mag. v. 298, which last seems to be the *Compsosoma violaceum* of Dej.

EUCOMATOCERA, White.

Narrow: head, thorax and elytra nearly equal in width. Antennæ with the first joint the longest, second very small, third to seventh fringed behind with longish hairs; eighth, ninth and tenth joints short, with long tufts of hairs on each side. Eye small, round. Legs short. Mouth (destroyed in the specimen in the British Museum) — ?

Eucomatocera vittata, White. Pl. I. f. 4. Black, deeply punctured; back of thorax with four pale longitudinal vittæ, two of these are lateral and two central close to each other; each elytron has three pale vittæ reaching from the base to the tip, one on the suture, one on the outer edge, and the third nearer the outer edge than the suture, the last two being connected on the shoulder. Elytra with at least seven rows of coarsish punctures, the vittæ filled with short, closely-placed light-coloured hairs.

Length $5\frac{1}{2}$ lines. Brit. Museum.

Hab. India. From the late Col. Whitehill's collection.

This pretty little longicorn beetle in general appearance is somewhat like *Hippopsis*, Serv. and St. Farg. Ency. Méth. x. 336. In the antennæ it somewhat approaches the curious genus *Tetraglenes*, Newman, Entomologist, 300 and 304, of which a figure is subjoined, Pl. I. f. 5 (*T. insignis*); this latter was brought from the Philippine Islands by the indefatigable Mr. Cuning.

VIII.—Descriptions of the Mymaridæ. Communicated by FRANCIS WALKER, Esq., F.L.S.

THE following descriptions are, excepting a few additions, extracted from MSS. kindly given to me by Mr. Haliday. The *Mymaridæ* were first noticed by him in the 'Entomological Magazine,' vol. i. p. 341.

MYMARIDÆ.

Tarsi pentameri.

Antennæ feminae 11-articulatæ.	Abdomen petiolatum...	<i>Ooctonus</i> .
	Abdomen subsessile ...	<i>Lymænon</i> .
Antennæ feminae 9-articulatæ		<i>Litus</i> .
Antennæ feminae 8-articulatæ.	Abdomen subsessile ...	<i>Arescon</i> .
	Abdomen sessile	<i>Alaptus</i> .

Tarsi tetrameri.

Antennæ feminae capitulo exarticulato.		
Abdomen sessile.....		<i>Anagrus</i> .
Abdomen subsessile.	Antennæ mari 12-articulatæ	<i>Anaphes</i> .
	Antennæ mari 13-articulatæ	<i>Panthus</i> .
Abdomen petiolatum.	Alæ quatuor, ulna lineari...	<i>Caraphractus</i> .
	ulna punctiformi	<i>Polynema</i> .
	Alæ quasi binæ	<i>Mymar</i> .
Antennæ feminae capitulo biarticulato		<i>Eustochus</i> .

GENERUM CHARACTERES.

Ooctonus. Tarsi pentameri, antennæ mari 13-, fem. 11-articulatæ; abdomen petiolatum: alæ anticæ vena trientali.

Lymænon (*Ooctonus*, sect. ii. olim). Tarsi pentameri: antennæ mari 13-, fem. 11-articulatæ: abdomen subsessile: alæ anticæ vena tenuissima dimidiante.

Arescon (*Litus*, sp. olim). Tarsi pentameri: antennæ mari 13-, fem. 8-articulatæ: abdomen subsessile: alæ anticæ vena tenuissima dimidiante.

Litus. Tarsi pentameri: antennæ fem. 9-articulatæ; abdomen sessile, segmento ferè unico amplissimo: alæ angustissimæ longissimæ.

Alaptus. Tarsi pentameri: antennæ fem. 8-, mari 10-articulatæ: abdomen sessile segmentis subæqualibus: alæ angustissimæ longissimæ.

Anagrus. Tarsi tetrameri: antennæ mari 13-, fem. 9-articulatæ: abdomen sessile, fem. acuminatum: alæ angustæ.

Anaphes. Tarsi tetrameri: antennæ mari 12-, fem. 9-articulatæ: abdomen subsessile ovatum.

Panthus. Tarsi tetrameri: antennæ mari 13-, fem. 9-articulatæ: abdomen subsessile*.

Caraphractus. Tarsi tetrameri: antennæ fem. 9-articulatæ scapo fusiformi: abdomen petiolatum segmento 2º amplissimo: alæ anticæ ulna lineari.

Polynema. Tarsi tetrameri: antennæ fem. 9-articulatæ, mari 13-articulatæ scapo dilatato compresso: abdomen petiolatum: alæ anticæ vena brevissima capitata.

Mymar. Tarsi tetrameri: antennæ mari 13-, fem. 9-articulatæ scapo gracili caput exsuperante: abdomen petiolatum: alæ anticæ petiolatæ, posticæ setacæ abortivæ.

Eustochus. Tarsi tetrameri: antennæ fem. 10-articulatæ capitulo biarticulato: abdomen petiolatum: alæ anticæ ulna lineari.

OCTONUS.

1. *insignis*. Fem. antennarum capitulo oblongo: $\frac{1}{4}$ lin.

2. *vulgatus*. Fem. antennarum capitulo ovato: alis completis, abdomine nigro: $\frac{1}{2}$ lin.

3. *notatus*. Fem. ut antea: abdomine rufo-piceo apice nigro: $\frac{1}{2}$ lin.

4. *hemipterus*. Fem. ut antea: alis abbreviatis: $\frac{1}{2}$ lin.

All these species are found in England and Ireland: *O. notatus* and *O. hemipterus* are perhaps only varieties of *O. vulgatus*.

There are two other genera which are connected with the *Mymaridæ*, but Mr. Haliday thinks that they are more nearly allied to the *Chalcidites*. These genera, *Dipara* and *Thysanus*, are described, the one in the 'Ent. Magazine' (i. 373, ii. 126), the other in the 'Annals of Nat. Hist.' (iv. 234). I am indebted to Mr. Haliday for the following remarks on *Dipara*, which has filiform palpi. It "differs from *Sphecomicrus* by the more oblate head, with two impressions above the antennæ, but not with the characteristic transverse line

* Species sub hoc genus congestæ vix satis congruunt, caractere artificiali.

(of the *Mymaridæ*); by the palpi, wings, shorter legs, podoon of the abdomen which is inserted higher than the hind coxæ, the metathorax correspondingly shorter and not so sloping. On the whole, I lay most stress on the palpi and wings as separating it from *Mymaridæ*; the other distinctions (except of the head) being rather generic or specific." *Thysanus*, the other genus, seems to connect *Trichogramma*, &c. with the *Mymaridæ*.

LYMÆNON.

1. *acuminatus* (Walker MSS.). Niger: antennis basi et pedibus piceo-pallidis: fem. abdomine elongato conico, terebra exerta.

2. *flavocinctus*.

3. *pictus*. Sulphureus: antennarum flagello capitis thoracisque signaturis anoque nigricantibus.

4. *litoralis*. Piceus: antennis basi, abdomine antice pedibusque sulphureis, his proparte infuscatis.

5. *fuscicornis*. Nigro-piceus, antennis pedibusque piccis.

L. litoralis is very abundant in England and Ireland. It is darker than *L. flavocinctus* and paler than *L. fuscicornis*, but perhaps all three are varieties of one species.

ARESCON.

1. *dimidiatus*. Piceus ano concolore, antennis basi abdomine pedibusque luteis: fere $\frac{1}{2}$ lin.

Taken many years ago near Belfast; it has not since occurred.

LITUS.

1. *cynipseus*. Niger capite thoraceque granulatis abdomine lævisimo alis infumatis pedibus ferruginosis: $\frac{1}{4}$ lin.

Var. Capite thoraceque piccis.

This species is common near London, and I have often found it on the windows of a greenhouse.

ALAPTUS.

1. *minimus*. Ferruginosus antennis et pedibus pallidis.

2. *fuscus*. Præcedente major colore obscurior antennis longioribus? vix revera species distincta.

These two seem to be only varieties of one species which is common on windows near London.

ANAGRUS.

Mr. Haliday has described three species (*atomus*, *incarnatus*, and *ustulatus*) of this genus, in which he has noticed three other species (*atricapillus*, *concinus*, and *albiscapus*), but I am unable to define them by good specific characters. Some of the species are very abundant.

ANAPHES.

1. *fuscipennis*. Niger alis fuscis antennarum basi pedibusque piceo-pallidis, fem. antennarum articulis 4^o et 5^o subæqualibus: $\frac{1}{3}$ lin.

Common near London and in Ireland.

2. *collinus*, Fem. Antennarum articulis a 4^o inde alternis minoribus.

Found by Mr. Haliday on heath on a mountain.

3. *longicornis*, Haliday MSS. *A. fuscipenni* affinis, antennis longioribus (Walker).

4. *regulus*, Haliday MSS. *A. fuscipenni* affinis, antennæ capitulo latiore (Walker).

5. *auripes*, Walker MSS. *A. fuscipenni* affinis, pedibus læte flavis.

6. *brevis*, Walker MSS. *A. fuscipenni* affinis, alis limpidis latioribus. July: forest of Fontainebleau.

7. *latipennis*, Walker MSS. *A. fuscipenni* longior, alis latioribus.

There may be more species of this genus, but I cannot distinguish them clearly. Mr. Haliday remarks that "the species are difficult to characterize; their colours are much alike, but the length of the tarsal joints and of the antennæ may be compared."

PANTHUS.

1. *crassicornis*. Niger antennarum basi pedum geniculis et tarsorum basi piceo-pallidis. Mas antennarum flagello piceo-pallido, compresso, striato.

2. *flavovarius*. Nigro flavoque varius, scutelli axillis flavis puncto nigro. Mas antennarum flagello gracili. Fem. capitulo longo-fusiformi.

CARAPHEACTUS.

1. *cinctus*. Fem. niger pedibus piceis, antennis basi metathoracis dorso coxis posticis et petiolo ferrugineis: metathorace bicarinato.

Found by Mr. Haliday on long grass in drains.

POLYNEMA.

1. *flavipes*, Walker MSS. (*ovulorum* olim: nomen errore ortum). Piceo-niger, alis obscure hyalinis, antennis basi pedibus et petiolo flavis; metathoracis gibbere petiolari elevato: fem. antennarum articulis 2^o et 3^o subæqualibus: $\frac{3}{4}$ lin.

Eutriche gracilis, Nees (Hym. Ich. aff. Mon. ii. 197), is a *Polynema*, and apparently of this species.

2. *fumipennis*. Fem. piceo-niger alis fusco-hirtis, antennis basi pedibus et petiolo flavis.

3. *pusillus*. Nigro-piceus alis obscure hyalinis, antennis basi pedibus et petiolo flavis; petiolo coxarum altitudine: fem. antennarum articulo 3^o brevissimo: $\frac{1}{4}$ lin. fere.

4. *fuscipes*. Ater alis hyalinis, antennarum pedicello pedibus et petiolo ferruginosis.

5. *atratus*. Ater alis hyalinis, pedibus piceis, antennarum pedicello petiolo genubus et tarsorum basi pallidioribus: fem. abdomine ovato terebra subexerta.

6. *euchariformis*. Ater alis hyalinis, pedibus piceis, antennarum pedicello petiolo genubus et tarsorum basi pallidioribus; terebra abdominis lanceolati fere dimidio longitudine.

Mr. Haliday has remarked that the characters which he has as-

signed to the above species do not seem to him to be quite satisfactory, and that all excepting the 5th and the 6th may be one species. There seem to me to be two forms of *P. flavipes*, which however can hardly be divided into two species, for there is a gradual transition from one of these forms to the other; the one has the legs all yellow, and it is more slender than the other, which has shorter and thicker antennæ, and brown hind tibiæ. This last variety approaches *P. fuscipes*, which has the base of the antennæ, the thighs and the tibiæ black, and the podoon dark fuscous. *P. fumipennis* is rather more slender than *P. flavipes*, and it is also distinguished by its more downy and more deeply fringed wings.

Judging by the figure of *Eutriche gracilis*, Nees, in Foerster's Mon. Pteromal. fig. 17, it does not seem to differ from *P. euchariformis*. I will here translate Foerster's description of this and of two other species:—

1. *Eut. gracilis*, Nees. The male has brown antennæ, 14-jointed, yellow at the base which is thick; the joints are slender and cylindrical.

2. *Eut. elegans*, Foerster. Black, shining: the antennæ brown, yellow at the base: the legs brownish, excepting the tips of the hind coxæ, the base and the tips of the thighs and tibiæ, and the tarsi, which are yellow; the last tarsal joint is brownish: the podoon of the abdomen is shorter than that of *E. gracilis*: the sheaths of the oviduct are black, and equal one-third of the length of the body. Fem. length $\frac{3}{4}$ lin.

3. *Eut. amara*, Foerster. Black, shining: the antennæ brown: the base of the antennæ, the legs with the coxæ, and the podoon of the abdomen are reddish yellow: the podoon is half the length of the body; the first abdominal segment is excavated, and projecting on each side: the head is very finely punctured: the mesothorax and the scutellum are strongly and distinctly punctured: the metathorax is very strongly punctured. Male, length $\frac{1}{2}$ lin.

Mr. Haliday observes that *Gonatocerus longicornis* (Nees, Hym. Ich. aff. Mon. ii. 193) is of this family, but of a different genus from any here described, if the description of the antennæ is correct. I have here translated Foerster's descriptions (Mon. Pterom. i. 45) of five other species of this genus:—

2. *Gon. ater*, Foerster. Black, shining: the antennæ are brown, yellow at the base: the legs are blackish brown; the knees, the tips of the tibiæ, and the tarsi, are yellow; the fore tibiæ are quite yellow. Male and female, length $\frac{3}{4}$ lin.

3. *Gon. flavus*, Foerster. Yellow: the antennæ, except at the base, a spot with two little accompanying spots on the prothorax, the middle of the scutellum, the metathorax, and the abdomen from the middle to the tip, are brown. Fem. length $\frac{1}{2}$ lin.

4. *Gon. flavipes*, Foerster. Black, shining: the base of the antennæ and the legs are yellow. Fem. length $\frac{1}{4}$ lin.

5. *Gon. parvus*, Foerster. Black, shining; the antennæ are brown; their base, the mouth and the legs are dirty yellow. Male and fem. length $\frac{1}{4}$ lin.

6. *Gon. minimus*. Black, shining: the antennæ and the legs with the coxæ are whitish yellow; the joints of the antennæ at the base and at the tips are much thicker than the other joints. Fem. length $\frac{1}{2}$ lin.

MYMAR.

1. *pulchellus*. Ferrugineus antennis apice oculisque fuscis, alis apice nigris.

EUSTOCHUS.

1. *atripennis*. Niger alis fuliginosis hirtis, antennis basi pedibus et petiolo ferrugineis, terebra abdomen superante.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

March 10, 1846.—Wm. Yarrell, Esq., Vice-President, in the Chair.

A paper was read entitled "Descriptions of two new species of *Cypræa*," by Lovell Reeve:—

CYPRÆA GASKOINII. *Cypr. testâ subabbreviato-ovatâ, solidiusculâ, lateribus incrassatis, marginatis, dentibus fortiusculis; dorso fulvo-stramineo, ocellis albidis, fusco-annulatis, parviusculis, sparsim ornato, lateribus castaneo-punctatis, basi albâ.*

Hab. — ?

This interesting species, of which I have seen two specimens, one in the British Museum and one in the collection of J. S. Gaskoin, Esq., partakes of the characters of the *Cypræa Cumingii* and *æontropia*; the back being covered with the same kind of small clear ringed eyes as the *C. Cumingii*. I dedicate it with a great deal of pleasure to the gentleman above named, to whom I am much indebted for the zeal with which he has worked out the small and less attractive species of the genus.

CYPRÆA PULICARIA. *Cypr. testâ subcylindraceo-oblongâ, anticè subdeclivi, latere dextro marginato, leviter contracto, aperturâ angustâ, dentibus minutis; pellucido-albâ, vel luted, lateribus dorsoque punctis rubido-fuscis subconspicuis aspersis.*

Hab. — ?

Allied to *C. piperata*, but perfectly distinct, though it has been hitherto mingled with that species in collections; it is of a smaller and more cylindrically oblong form, and is not banded, whilst the dots are more conspicuous.

The following paper was also read:—

"Descriptions of three new species of *Cypræa*," by J. S. Gaskoin, Esq.

CYPRÆA PELLUCIDULA. *Cyp. testâ ovatâ, nitidâ, albicante subhyalâ; costellis continuis ad utrumque latus aperturâ terminatis; dentibus æqualibus, minimis, numerosisque; sulco columellari profundo, lato; lined dorsali nullâ; extremitatibus valdè productis et obtusis; aperturâ rectâ, posticè subsinuâtâ.*



SEMIPELLUCID COWRY.—Shell ovate, of a beautiful semipellucid white colour, shining; the ribs—anterior, posterior and dorsal—terminate in teeth on both sides and ends of the aperture, and traverse the columellar groove to its inner edge; a few ribs do not continue over the dorsum; the teeth, even, fine, and numerous, about thirty on the lip; columellar groove, deep and broad; base round; margins wide; no dorsal impression; extremities much produced, and obtuse; aperture straight, except a slight curve at its posterior extremity. Size $\frac{1}{10}$ ths of an inch.

Hab. South Pacific.

Cab. Gaskoin, &c.

Differs from *exigua* of Gray, the *tremeza* of Duclos, in being less gibbous, ribs more numerous, finer, more even and regular, and but two or three terminate on the sides of the shell, none on the dorsum; they pass continuously over the shell from one side of the aperture to the other; shell perfectly colourless, and has no dorsal line or impression.

CYPRÆA PISUM. *Cyp. testâ spheroidali, pallescente; costellis prominentibus, ex aperturâ ad lineam dorsalem decurrentibus, et in lineam attenuatam terminantibus; dentibus prominentibus; sulco columellari lato; aperturâ latiusculâ posticâ flexuosa; basi rotundatâ; margine externo incrassato, supra extremitates extenso; extremitatibus crassis; lined dorsali profundâ, ex extremitatibus posticis ad anticam testæ partem continuâ.*

PEA COWRY.—Shell spheroidal, of a very light fawn colour; ribs large and prominent; nearly every rib extends from the aperture and terminates generally, tapering to a point, at the dorsal depression; mostly the terminations on one side pass between those of the other, especially on the anterior half of the shell; each third or fourth rib, amounting to about seven, ends on the lip at the base of the shell; all the other ribs on both sides form, by continuance, the teeth, which are strong and prominent; about twenty-three on the columellar side of the aperture, which extend across the columellar groove and serrate its inner edge; those on the outer side or lip about twenty-one in number; columellar groove broad and deep; aperture rather wide, curved, particularly at the posterior portion; base round; margin on the outer side very thick, extending over the beaks; none on the columellar side; extremities or beaks obtuse, thick, and slightly produced; dorsal depression deep, extending from between the posterior extremities to the anterior end of the shell, being more deeply impressed beside the apex.

Long. $\frac{4}{10}$ ths of an inch.

Hab. East Indies.

Specimen unicum. *Cab.* Gaskoin.

The characters of this shell are so distinctive that it bears no relation to any yet described *Cypræa*; it is nearest in form to *Cypræa formosa* of Gaskoin.

CYPRÆA PULLA. *Cypr. testâ ovatâ, nitidâ, fusco-rubescente, costellis dentibusque concoloribus; costellis usque ad lineam dorsalem*

ut plurimum continuis, et ad margines aperturæ terminantibus; sulco columellari albedo, margine interno dentibus serrato; aperturæ angustâ; labio externo extus incrassato; extremitatibus paululum productis.

REDDISH-BROWN COWRY.—Shell ovate, shining, of a dark reddish-brown colour; ribs the colour of the shell, mostly terminate at the dorsal depression; a very few on the sides of the shell, thence extending to form teeth on both sides of the aperture; on the outer side or lip about eighteen, and about sixteen on the columellar side; columellar groove whitish, the teeth traverse it and serrate its entire inner edge; aperture narrow, very slightly spiral; base round; margin thick, none on the columellar side; extremities slightly produced.

Differs from the *fusca* of Gray, in the ribs of the base, and the teeth not being white, but of the same colour as the shell; in the ribs being much finer, in having a dorsal line or impression, and in being of a deeper and redder colour.

Long. $\frac{2.5}{100}$ ths of an inch.

Hab. —?

Cab. Gaskoin, &c.

March 24.—William Yarrell, Esq., Vice-President, in the Chair.

The first communication was the following Note from Mr. Gulliver, on the size of the Blood-Corpuscles of Birds, with measurements by Dr. Davy of the Blood-Corpuscles of some Fishes and of a Humming Bird.

While my friend Dr. Davy was employed by our Government on a special medical service at Constantinople, and afterwards as principal medical officer at Barbadoes, he communicated to me the measurements, appended hereto, of the blood-corpuscles of some animals.

Medical officers residing in different parts of the world might render a very acceptable service to physiology, by giving an account of the blood-corpuscles not yet examined of various animals; and doubtless some new or otherwise interesting facts would thus be obtained, especially among the larger *Cetacea*, the smallest birds, the cartilaginous fishes, reptiles and amphibia.

Dr. Davy shows that some foetal sharks, six or seven inches long, have oval corpuscles like those of the adult; and he confirms Professor Wagner's observation as to their large size in this family:

Although, in a strictly natural family of Mammalia, as the Rodents or the Ruminants, there is a relation between the size of the corpuscles and that of the animal, there is no such relation in Mammalia of different orders. But in the entire class of Birds the law for the size of the corpuscles is the same as in a single family of Mammalia; at least among birds no example has yet been found of comparatively large corpuscles in the smallest species and of more minute corpuscles in the largest species. I have elsewhere* remarked the necessity of examining the blood of the Humming Birds with reference to this view; which is now supported by Dr. Davy's observation, showing that the corpuscles of a bird of this kind are as small as those

* Gerber's Anatomy, Appendix, p. 26. Lond. 1842.

hitherto examined of any bird, as may be seen by reference to the copious tables of my measurements of the blood-corpuscles of Vertebrata, in the 'Proceedings of the Zoological Society,' October 14, 1845. The long diameter of the corpuscles of *Rallus Philippinensis* is 1-2097th of an inch, and not 1-2997th, as there printed. In my observations in this class, those great birds the Ostrich and the Javanese Cassowary were found to have the largest blood-corpuscles; while the smallest corpuscles occurred in the little insectivorous and granivorous birds. The average length of the corpuscles of the Cassowary was 1-1455th and their breadth 1-2800th of an inch.

These remarks all refer to the red corpuscles; and the measurements of them in the following notes by Dr. Davy are, like all my measurements, in vulgar fractions of an English inch.—G. G.

Torpedo oculata.—Blood from heart: long diameter of the corpuscles about 1-800; short diameter 1-1000. Some further particulars have been given respecting them in a paper deposited in the archives of the Royal Society.

Spigota (Perca marina).—Blood from vessels of gills: long diameter of corpuscles from 1-4000 to 1-3750; short diameter 1-4000.

Pylamedes (Thynnus Pylamedes).—Long diameter of corpuscles about 1-2000; short diameter about 1-3000.

A small species of Mackerel, corpuscles 1-2286 by 1-4000. Taken from the heart; oil particles four times as large were mixed with the red particles.

A small fish; species of it I have not yet made out; corpuscles about 1-4000 to 1-3000, by about 1-6000.

Another species I have not yet made out; particles about 1-3000 by 1-4000.

Another small species, not made out; particles, most of them circular, about 1-4000; a few elliptical.

Sword-fish.—Particles, long diameter, from 1-2000 to 1-3200; short diameter, 1-3200 to 1-5333.

Red Mullet.—Many particles circular, about 1-4000; some elliptical, about 1-2286 by 1-3200.

John Dory.—Corpuscles 1-1777 by 1-2666; some nearly circular.

A species of large Mackerel; corpuscles about 1-2000 to 1-2666, by about 1-4000.

Small spotted Dog-fish.—Corpuscles about 1-1333 by 1-2000.

Sturgeon.—Corpuscles about 1-1600 by 1-2666.

Squalus acanthias.—Corpuscles about 1-1231 by 1-1777; nucleus elliptical.

Brown spotted Dog-fish.—Corpuscles from 1-1000 to 1-1143, by 1-1600 to 1-1455.

Tunny (Thynnus communis).—Corpuscles 1-1600 by 1-2666.

Eel, species I have not made out; corpuscles about 1-2000 by 1-3200; a few circular.

A species of small fish I have not yet made out; corpuscles about 1-2666 by 1-4000.

A species of Scyllium, a cartilaginous fish, probably a new species. I have sent a specimen to Chatham. Corpuscles about 1-1000 by 1-2000.

In a female of the same kind some of the blood-particles were as large as 1-666 by 1-888; nucleus about 1-2666 and globular.

Fœtus of *Squalus acanthias*; corpuscles about 1-1000 by 1-1600; fœtus about seven inches long.

Fœtus of *Squalus squatina*, about six inches long; corpuscles about 1-1000 by 1-1333.

Small fish; I have not yet made out the species; corpuscles about 1-2000 by 1-2666.

Another small fish, the kind of which is at present unknown to me; corpuscles about 1-2666; the majority of them circular.

These are the results of the few observations I made in Constantinople. Not having books to refer to, I could not at the time determine several of the fishes, nor have I yet had leisure to compare my notes with authorities on the subject, to make out the species. The size of the particles of *all* the cartilaginous fishes is very much larger than of the osseous; the particles were few in number, transparent, soft, readily changing their shape from slight pressure; *nuclei distinct*.

I have given the dimensions just as I noted them down. All the fishes were fresh. J. D.

Constantinople, Jan. 8, 1842.

I have had a Humming Bird killed and instantly brought to me; its blood-corpuscles were beautifully definite, regular and uniform. The disc very thin, perfectly flat, the nucleus slightly raised, and the two corresponding in outline. The corpuscle 1-2666th by 1-4000th of an inch; the long diameter of the nucleus very nearly 1-4000th. The blood was small in quantity, as I apprehend is the blood of birds generally, but not deficient in red corpuscles. I have found its temperature to be about 105°. Whilst its solid food is insects, I believe its drink is the sweet juice of flowers. I have not a book to refer to for the species. Tail-feathers black; head green; rump green; wings brownish, almost black. J. D.

Barbadoes, Jan. 7, 1846.

The next paper was entitled "Descriptions of thirty new species of *Helicea*, belonging to the collection of H. Cuming, Esq.," by Dr. L. Pfeiffer:—

1. *HELIX SWAINSONI*, Pfr. *Hel. testâ umbilicatâ, utrinque depressissimâ, tenui, pellucidâ, subarcuatim ruguloso-striatâ, virescentifulvâ, lineis 2 rufis ornatâ; anfractibus 5 depressis, medio convexiusculis, carinatis; carinâ rufescente, acutâ, breviter prominente, subrugulosâ; umbilico mediocri, profundo; aperturâ perobliquâ, depressâ securiformi; peristomate simplice, recto, margine columellari subincrassato.*

Diam. 16, alt. 5 mill.

From Tahiti; under stones (B. W. Tucker, Esq.).

2. *HELIX STENOSTOMA*, Pfr. *Hel. testâ imperforatâ, globuloso-depressâ, solidâ, sublævigatâ, nitidâ, albâ, fasciâ unâ fuscâ ad peripheriam et seriebus 2 macularum aurantiarum ornatâ, punctisque griseis obsolete aspersâ; anfractibus 4½ vix convexiusculis, ultimo ventroso, anticè abruptè deflexo; aperturâ subhorizontali,*

ellipticd; peristomate albo, labiato, marginibus approximatis, supero breviter expanso, basali arcuato, appressè reflexo.

Diam. 13-15, alt. $8\frac{1}{2}$ -9 mill.

Locality unknown.

3. *BULIMUS HOLOSTOMA*, Pfr. *Bul. testâ rimato-perforatâ, cylindraceâ, apice obtuso, opaco, carneo-cinereo, obliquè et validè plicato-costato; anfractibus 7 subplanulatis, deorsum attenuatis, supernè subangulatis, ultimo $\frac{1}{2}$ longitudinis subæquante; aperturâ verticali, oblongâ, integrâ; peristomate simplice, acuto, marginibus subparallelis, supero breviter soluto.*

Long. 9, diam. $2\frac{3}{4}$ mill.

From Cobija, Bolivia, on the hills under bushes (H. Cuming).

The same species brought from the Sandwich Islands by B. W. Tucker, Esq. ?

4. *BULIMUS LEAI*, Pfr. *Bul. testâ imperforatâ, ovato-conoided, obtusâ, solidulâ, obliquè tenuiter striatâ, nitidâ, fulvescenti-albâ; anfractibus $5\frac{1}{2}$ convexiusculis, ultimo spirâ breviorè, basi subgloboso; columellâ strictiusculâ, declivè, per dilatatâ, subplanatâ, basi subtruncatâ; aperturâ obsoletè subtetragono-rotundatâ, intus albâ; peristomate breviter expanso, subincrassato.*

Long. 37, diam. 24 mill.

From the Philippine Islands (H. Cuming).

Nearly allied to *Bul. cincinniformis*.

5. *BULIMUS FENESTRATUS*, Pfr. *Bul. testâ perforatâ, subfusiformi-oblongâ, solidulâ, longitudinaliter profundè undulato-sulcosâ, albâ, fasciis infra 65, et strigis undulatis nigricanti-castaneis fenestratâ; suturâ crenulatâ; anfractibus $6\frac{1}{2}$ convexiusculis, ultimo spiram conicam, acutam paulò superante; columellâ subplicatâ, obliquè recedente, lilaceâ; aperturâ oblongo-semiovali, intus lilacini; peristomate expanso, margine columellari supernè angulatim reflexo, subappresso.*

Long. 45, diam. 18 mill.

From Mexico.

6. *BULIMUS DARWINI*, Pfr. *Bul. testâ profundè rimatâ, ovato-conicâ, solidulâ, rugis nodulatis et crispis, validè sculptis, sordidè albidis; spirâ conicâ, apice acutiusculo, corneo; anfractibus 6 convexis, 3 supremis sublavigatis, ultimo spiram subæquante; columellâ subtortâ, subverticali; aperturâ latâ, subovali, intus nitidulâ, albâ, tuberculo calloso, profundo in ventre anfractûs penultimi coarctatâ; peristomate simplice, recto, margine dextro supernè arcuato, columellari per dilatato, patente.*

Long. 17, diam. 19 mill.

From the Gallapagos Islands; found on bushes (C. Darwin, Esq.).

7. *BULIMUS SCULPTURATUS*, Pfr. *Bul. testâ perforatâ, ovato-turritâ, tenuiusculâ, longitudinaliter subremotè et validè undulato-rugosâ, interstitiis rugarum spiraliter argutè striatâ, fuscâ, spirâ elongato-conicâ, apice acutiusculo, corneo; anfractibus 7 convexis, ultimo $\frac{3}{4}$ longitudinis subæquante; columellâ strictâ, basin aper-*

turæ attingente; aperturâ ellipticâ, basi angulatâ; peristomate simplice, acuto, margine columellari fornicatim reflexo, libero.

Long. 14, diam. $6\frac{1}{2}$ mill.

From the Gallapagos Islands; found on bushes (Darwin).

8. *BULIMUS HONDURASANUS*, Pfr. *Bul. testâ apertè perforatâ, ovato-conicâ, lævigatâ, nitidâ, flavescenti-albidâ, fasciis 3 æquidistantibus umbilicali fusco-roseis ornatâ; anfractibus 6 vix convexiusculis, ultimo spirâ conicâ, acutâ paulò breviorè; columellâ strictâ, verticali; aperturâ ovali-oblongâ, intus concolore; peristomate simplice, recto, margine columellari in laminam triangularem subfornicatam expanso.*

Long. $18\frac{1}{2}$, diam. 10 mill.

From Honduras (Dyson).

9. *BULIMUS SARCODES*, Pfr. *Bul. testâ apertè perforatâ, oblongo-conicâ, tenui, striatâ, lineis spiralibus sub lente obsoletissimè decussatâ, carnèâ; spirâ conicâ, acutiusculâ; anfractibus 6 convexiusculis, ultimo $\frac{4}{5}$ longitudinis subæquante; columellâ leviter arcuatâ; aperturâ ovali, intus nitidâ; peristomate recto, acuto, margine dextro arcuato, columellari dilatato, fornicatim patente.*

Long. $17\frac{1}{2}$, diam. 8 mill.

From Honduras (Dyson).

10. *BULIMUS TUCKERI*, Pfr. *Bul. testâ perforatâ, cylindraceo-subulatâ, tenui, longitudinaliter distinctè striatâ, nitidâ, cernâ; spirâ elongatâ, apice acutiusculâ; anfractibus 9 convexiusculis, ultimo $\frac{1}{2}$ longitudinis vix æquante; columellâ obliquè recedente; aperturâ ovali-oblongâ; peristomate simplice, acuto, margine columellari supernè dilatato, patente.*

Long. 9, diam. $2\frac{3}{4}$ mill.

From Sir Charles Hardy's Island, Pacific Ocean (B. W. Tucker, Esq.).

11. *BULIMUS GRUNERI*, Pfr. *Bul. testâ angustè perforatâ, cylindraceo-turritâ, lævigatâ, nitidâ, albidâ unicolore vel fusco obliquè strigatâ vel macularum spadicearum seriebus nonnullis cingulatâ; spirâ elongatâ, apice acuto; suturâ albo-marginatâ; anfractibus 7-8 planis, ultimo $\frac{2}{3}$ longitudinis æquante; columellâ subortâ; aperturâ ovali-oblongâ; peristomate simplice, recto, margine columellari basi subexpanso, supernè fornicatim reflexo.*

Long. 28, diam. 10 mill.

β. *Perforatione apertâ, margine peristomatis fornicatim patente.*

From Mexico.

12. *BULIMUS VINCENTINUS*, Pfr. *Bul. testâ subperforatâ, fusiformi, tenui, lævigatâ, lineis concentricis leviter impressis sculptâ, nitidâ, pellucidâ, lutescenti-hyalinâ, fasciis 5 subæqualibus violaceo-fuscis ornatâ; spirâ conicâ, apice acutiusculâ, nigro; anfractibus 6 planiusculis, ultimo spiram subæquante, basi attenuatâ; columellâ paulò recedente; aperturâ obliquâ, ovali-oblongâ, intus concolore; peristomate tenui, margine dextro breviter expanso, supernè dilatato, columellari in laminam triangularem angulatim reflexo, perforationem ferè claudente.*

Long. 30, diam. $11\frac{1}{2}$ mill.

β. unicolor citrinā vel stramineā, paulō gracilior.

Long. 30, diam. $10\frac{1}{2}$ mill.

From the Island of St. Vincents (Rev. L. Guilding): var. *β.* from Venezuela; on bushes (Linden).

13. *BULIMUS ORBIGNYI*, Pfr. *Bul. testā umbilicatā, oblongo-turritā, tenui, regulariter et confertim plicatā, albā; spirā turritā, acutā; anfractibus $7\frac{1}{2}$ convexiusculis, ultimo $\frac{2}{3}$ longitudinis subæquante; umbilico angusto, aperto; columellā vix arcuatā; aperturā oblongā; peristomate simplice, acuto, marginibus subparallelis supernè conniventibus, columellari subfornicato, patente.*

Long. 19, diam. 8 mill.

Locality unknown.

14. *BULIMUS PETITI*, Pfr. *Bul. testā perforatā, ovato-conicā, solidā, longitudinaliter rugoso-striatā, striis concentricis, irregularibus obsoletissimè subdecussatā, fuscā; spirā conicā, apice obtuso, pallido; suturā crenulatā, albedo-marginatā; anfractibus 6 planiusculis, ultimo spiram paulō superante; columellā leviter arcuatā; aperturā acuto-ovali, intus nitidulā, lividā; peristomate simplice, recto, margine dextro acuto, columellari dilatato, albedo, liberè reflexo.*

Long. 26, diam. 16 mill.

From Peru.

15. *BULIMUS SANDWICENSIS*, Pfr. *Bul. testā perforatā, cylindraco-turritā, apice acutiusculo, tenui, striatulo, corneo, strigis albis, opacis, irregularibus, variegato; anfractibus 10 vix convexiusculis, ultimo $\frac{1}{3}$ longitudinis non æquante, basi circa perforationem apertam subcompresso; aperturā oblongo-ovali; peristomate simplice, tenui, margine dextro leviter arcuato, expansiusculo, columellari membranaceo, fornicato, patente.*

Long. 15, diam. $4\frac{1}{2}$ mill.

From the Sandwich Islands (B. W. Tucker, Esq.).

16. *PUPA PACIFICA*, Pfr. *Pup. testā profundè rimatā, ovato-cylindraced, apice obtusiusculo, solidulo, sublavigato, fusco-corneo; anfractibus $5\frac{1}{2}$ convexis, ultimo $\frac{1}{3}$ longitudinis subæquante; aperturā semiovali, edentulā; peristomate breviter expanso, intus albo-labiato, margine dextro supernè breviter curvato, tuberculo calloso interdum juxtaposito, columellari latiore, patente.*

Long. $4\frac{1}{2}$, diam. $2\frac{1}{2}$ mill.

From Sir Charles Hardy's Island, Pacific Ocean (B. W. Tucker, Esq.).

17. *ACHATINA CYLINDRACEA*, Pfr. *Ach. testā subcylindraced utrinque breviter attenuatā, levigatā, nitidā, lutescenti-corneā; suturā lineari, albo-marginatā; spirā brevi, conoidē, obtusiusculā; anfractibus 5 planulatis, ultimo $\frac{2}{3}$ longitudinis æquante; columellā tortā, laminā callosā, albā, acutè prominente, per longitudinem munitā, subtruncatā; aperturā angustā, acuminato-oblongā, basi rotundatā; peristomate simplice, margine dextro medio antrorsum dilatato.*

Long. 13, diam. $5\frac{1}{2}$ mill.

From Tortilla, Central America; in damp places.

Belongs, by the formation of the columella, to that aberrant group of *A. columna*, *Lattrei*, *aberrans*, *Dysoni*, *anomala*, *splendida*, &c.

18. *ACHATINA DYSONI*, Pfr. *Ach. testd oblongo-conicd, tenuissimâ, glabrâ, pellucidâ, nitidâ, lutescenti-corned; spirâ conicâ, obtusiusculâ; suturâ simplicē; anfractibus 5 convexiusculis, ultimo $\frac{3}{4}$ longitudinis subæquante, deorsum subdilatato; columellâ arcuatim tortâ, subcallosâ, vix truncatâ; aperturâ angustâ, acuminato-oblongâ, basi rotundatâ; peristomate simplicē, tenui, margine dextro medio antrorsum dilatato.*

Long. $9\frac{1}{2}$, diam. 4 mill.

From Honduras; found under decayed leaves by Mr. Dyson.

19. *ACHATINA SANDWICENSIS*, Pfr. *Ach. testd ovato-conicâ, obliquè striatâ, subopacâ, sordidè corned; spirâ conicâ, obtusiusculâ; suturâ lined impressâ marginatâ; anfractibus $6\frac{1}{2}$ planulatis, ultimo $\frac{3}{4}$ longitudinis vix superante; columellâ arcuatâ, plicato-tortâ; aperturâ latâ, semiovali; peristomate simplicē, margine dextro obtuso, columellari subreflexo, appresso.*

Long. 7, diam. $3\frac{1}{2}$ mill.

From the Sandwich Islands (B. W. Tucker, Esq.).

20. *ACHATINA (GLANDINA) SOWERBYANA*, Pfr. *Ach. testd ovato-fusiformi, tenuiusculâ, diaphand, longitudinaliter confertim plicatâ, striis spiralibus, inæqualiter distantibus decussato-granulatâ, fulvo-rubellâ, strigis remotis, fuscis ornatâ; spirâ conicâ, apice acutâ; suturâ albo-marginatâ, crenulatâ; anfractibus $7\frac{1}{2}$ planiusculis, ultimo $\frac{5}{8}$ longitudinis subæquante; columellâ arcuatâ, basi abruptè truncatâ; aperturâ acuminato-oblongâ; peristomate simplicē, marginibus callo tenui junctis, dextro repando.*

Long. 88, diam. 38 mill.

From Totontepec, Mexico; on decayed vegetable matter.

21. *ACHATINA (GLANDINA) ISABELLINA*, Pfr. *Ach. testd fusiformi-oblongâ, tenui, nitidâ, sub lente spiraliter confertim striatâ, pellucidâ, isabellinâ; suturâ lined impressâ marginatâ; anfractibus 6 convexiusculis, ultimo spirâ conicâ, obtusâ vix breviorē; columellâ obliquâ, strictiusculâ, supra basin aperturæ elliptico-oblongæ breviter truncatâ; peristomate simplicē, obtuso.*

Long. 26, diam. medio 10 mill.

From Mexico; found in decayed trunks of trees.

22. *ACHATINA (GLANDINA) TORTILLANA*, Pfr. *Ach. testd subfusiformi-ovata, solidulâ, striis longitudinalibus, confertis regulariter sculptâ, nitidâ, pellucidâ, pallidè corned, maculis et strigis opacis, lactescentibus irregulariter signatâ; suturâ submarginatâ; anfractibus $7\frac{1}{2}$ convexiusculis, ultimo spiram conicam, obtusam, vix superante; columellâ fortiter arcuatâ, supra basin aperturæ elliptico-oblongæ abruptè truncatâ; peristomate simplicē, obtuso, margine dextro medio subdilatato.*

Long. 20, diam. medio 8 mill.

From Tortilla, Central America; in damp places.

23. *BULIMUS AURATUS*, Pfr. *Bul. testd subobtectè perforatâ, oblongo-turritâ, tenui, longitudinaliter subtiliter striatâ, pellucidâ, auratâ, lineis saturatioribus spiralibus obsolete notatâ; spirâ turritâ, obtusâ; suturâ submarginatâ, minutè crenulatâ; anfractibus 7 vix convexiusculis, ultimo $\frac{2}{3}$ longitudinis vix æquante; columelli strictiusculi; aperturâ ovali-oblongâ; peristomate simplice, recto, margine columellari breviter reflexo, subappresso.*

Long. 30, diam. 10 mill.

Locality unknown.

24. *BULIMUS PANAYENSIS*, Pfr. *Bul. testd imperforatâ, subulatâ, tenui, lævigatâ, pellucidâ, cereo-hyalinâ; spirâ elongatâ, apice obtusâ; anfractibus 8 latis, vix convexiusculis, ultimo $\frac{1}{4}$ longitudinis vix æquante; columella brevi, strictiusculi; aperturâ ovali-oblongâ, basi subangulatâ; peristomate simplice, recto, margine columellari breviter reflexo, appresso.*

Long. 11, diam. $2\frac{1}{2}$ mill.

From Dingle, island of Panay (Cuming).

25. *BULIMUS PERSPECTIVUS*, Pfr. *Bul. testd umbilicatâ, oblongo-conicâ, tenui, striatula, pellucidâ, nitidâ, rufo-corned; spirâ elongato-conicâ, acutiusculi; anfractibus 7 convexiusculis, ultimo $\frac{2}{3}$ longitudinis æquante, basi subangulatim compresso; umbilico angusto, profunde perspectivo; aperturâ oblongâ; peristomate simplice, rufo, marginibus conniventibus, callo tenui junctis, dextro breviter expanso, columellari dilatato, patente.*

Long. 16, diam. $6\frac{1}{2}$ mill.

Locality unknown.

26. *BULIMUS MERIDANUS*, Pfr. *Bul. testd perforatâ, oblongo-subfusiformi, striatula, lævigatâ, lutescenti-albidâ, fasciis angustis cæruleo-fuscis, vel latis castaneis, strigatim interruptis ornatâ; spirâ turrito-conicâ, acutiusculâ; anfractibus 6 planiusculis, ultimo spiram æquante; columella leviter arcuatâ; aperturâ oblongo-ovali, intus concolore; peristomate simplice, margine dextro breviter expanso, columellari dilatato, fornicatim reflexo, albo, perforationem ferè occultante.*

Long. 29, diam. 11 mill.

From Merida, Andes of Bolivia.

27. *BULIMUS MONTEVIDENSIS*, Pfr. *Bul. testd perforatâ, ovato-conicâ, subfusiformi, tenui, obliquè striatula, non nitente, albidâ, opacâ, lineis longitudinalibus crebris, pellucidis, pallide corneis strigatâ; spirâ conicâ, apice acuto; anfractibus 7-8 planiusculis, ultimo spirâ paulò breviorè, interdum medio obsolete angulato; columella verticali, strictâ; aperturâ oblongo-ovali; peristomate simplice, recto, margine columellari membranaceo, fornicatim reflexo.*

Long. 28, diam. 12 mill.

From Montevideo, Buenos Ayres.

28. *BULIMUS JUSSIEUI*, Val. Mur. *Bul. testd perforatâ, ovato-conicâ, striis rudibus incrementi spiralibusque minutis irregulariter decussato-granulatâ, corned, obliquè albido-striatâ; spirâ conicâ,*

acutiusculd; *anfractibus* 6 *convexiusculis*, ultimo *spiram æquante*; *columellâ recedente, subarcuatâ*; *aperturâ ovali, intus nitidè albâ*; *peristomate simplice, recto, margine columellari albido, dilatato, subfornicatim reflexo.*

Long. 32, diam. 15 mill.

From Cusoo.

29. *BULIMUS BOLIVIANUS*, Pfr. *Bul. testâ perforatâ, oblongo-turritâ, lineis impressis sub lente minutissimè decussatâ, nitidâ, albido-rubellâ, fasciis latis, badiis, subinterruptis ornatâ*; *spirâ turritâ, apice acuto, rubro*; *anfractibus* 7 *planis, ultimo convexiusculo, $\frac{4}{5}$ longitudinis subæquante*; *columellâ torto-plicatâ, roseâ*; *aperturâ ovali-oblongâ, intus concolore*; *peristomate simplice, margine dextro breviter expanso, columellari per dilatato, reflexo, excavato, perforationem rimæformem ferè tegente.*

Long. 33, diam. 13 mill.

From Merida, Andes of Bolivia.

30. *BULIMUS OPARANUS*, Pfr. *Bul. testâ subimperforatâ, subulatâ, longitudinaliter distinctè striatâ, tenui, hyalino-cereâ*; *spirâ subulatâ, acutiusculd*; *anfractibus* 9 *vix convexiusculis, ultimo $\frac{3}{4}$ longitudinis subæquante*; *columellâ vix arcuatâ*; *aperturâ oblongo-ovalî*; *peristomate simplice, recto, margine columellari fœnicatim brevissimè reflexo, adnato.*

Long. 11, diam. 3 mill. (Spec. max.)

From the island of Opara; found in earth at the roots of plants (H. Cuming, Esq.).

BOTANICAL SOCIETY OF EDINBURGH.

May 14, 1846.—Professor Balfour, President, in the Chair.

Donations to the library and museum were announced, and several Fellows were elected.

The following communications were read :—

1. "Biographical Sketch of the late Professor Graham," by Dr. Ransford.

"Robert Graham was the third son of the late Dr. Graham of Stirling (afterwards Moir of Leckie), and of Mrs. Anne Stewart, daughter of the late Charles Stewart, Esq., of Appin. His early education was obtained at Stirling. He was apprenticed in 1804 to the late Mr. Andrew Wood, F.R.C.S. Edinburgh, and became a licentiate of the College of Surgeons in 1808, and graduated at the University during the same year. He then studied for twelve months in London at St. Bartholomew's Hospital, and afterwards commenced practice in Glasgow. In 1812 he was appointed Physician to the Infirmary of the latter city and Lecturer on Clinical Medicine, and published an essay on the continued fever, which at the time was epidemic in Glasgow. Dr. Graham succeeded Dr. Brown as Lecturer on Botany; and in the following year, having been appointed by the Government Professor of Botany in the University of Glasgow, he succeeded, in conjunction with some other gentlemen, in establishing a Botanical Garden, and took the principal share in its for-

mation. Dr. Graham married the youngest daughter of David Carrick Buchanan, Esq., of Drumpellier and Mount Vernon. On the decease of Dr. Rutherford he was appointed by the Crown Regius Professor of Botany and Keeper of the King's Garden, and by the patrons to the Professorship of Medicine and Botany in the University of Edinburgh. Soon after his appointment, and principally through his exertions, the present Botanical Garden was formed; and with the able assistance of Mr. William M'Nab, all the trees, shrubs and plants were removed from the garden at Leith Walk to their present situation. He also prevailed upon the Government to increase the annual allowance to the institution (which is still insufficient), and expended considerable sums from his own resources to maintain its efficiency. Dr. Graham's character as a clinical physician and private practitioner was distinguished by unbending integrity and honour. He succeeded in greatly interesting the students in botanical science, by giving many prizes, and making botanical excursions." Dr. Ransford then noticed his plan of conducting the course, gave some anecdotes of his journeys, and alluded to his annual descriptions of new plants flowering in Edinburgh; the great interest he displayed in the welfare of the Botanical Society, of which he was an original member, and thrice President; the history of the formation of the Society, and his contributions to its Transactions; his papers read to the Royal Society on the Gambooge plant; and his researches into the nomenclature and botanical sources of the articles of the *Materia Medica*. "He was most attentive to the interests of the University, and supported all the measures of reform in medical education carried into effect between the years 1822 and 1836. In 1840 Dr. Graham was elected President of the Royal College of Physicians; he was a member of most of the scientific societies in this city, and President of many of them. From overtaxing his strength during one of his botanical excursions in 1843, he dated the commencement of his last illness. His case was an obscure one. The Town Council, at his request, appointed Dr. Joseph Hooker to be his assistant. Although in a very weak state, he introduced him to the class on the morning of the 5th of May 1845. This was the last occasion on which he visited the gardens." Dr. Ransford then gave anecdotes of his generosity and resignation during his illness. "He was removed to Coldoch, in Perthshire, on the 24th of July, and expired on the 7th of August. The disease was ascertained to be a malignant tumour resting on the dorsal vertebræ, and pressing upon the thoracic duct, vessels and nerves. He was buried on the 13th in the private burying-ground of Leckie, belonging to his brother Charles A. Moir, Esq. Dr. Graham's whole life was distinguished by uprightness of conduct, cheerfulness of disposition, combined with real kindheartedness. He was very energetic and industrious, most conscientious in the discharge of every duty, and beloved by all who were acquainted with him."

2. "Notice of the Vegetation in the neighbourhood of Lisbon, in a letter to Dr. Neill," by W. C. Trevelyan, Esq.

In this letter, which is dated 11th March, Mr. Trevelyan writes—
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"It was a delightful change of climate we made in six days' sail from Britain, landing on a quay here, with a border in which bananas were flourishing, with lofty bushes of heliotrope covered with blossoms, and geraniums in full flower; an avenue of young *Phytolacca dioica*, and other symptoms of a warm climate. The first crop of peas we find is over, beans are now in perfection, strawberries in fruit, sweet roses in blossom. The wild plants are coming forward rapidly; the limestone hills are covered with the beautiful *Iris Sisyrinchium* and *sambucina*, though the latter is not so abundant; *Ophrys vespifera* or *lutea*, *arachnites* and *Orchis morio*, several *Antirrhinums*, *Cistuses*, the delicate *Ulex australis*, several *Rutas*, *Cerinthe aspera*, or a variety with purple blossoms striped with white (that I got in Italy and Greece was tinged with yellow); several species of *Calendula*; *Bellis annua*, *sylvestris* and *perennis*, the last the least common; the beautiful *Narcissus Bulbocodium*, *Ornithogalum umbellatum*, *Vinca major* in great profusion and beauty; *Cynoglossum*, *Lupinus*, *Illecebrum Paronychia*, *Arum Arisarum* and *maculatum* (or one which comes very near it), *Aristolochia longa*, *Asphodelus ramosus* and *fistulosus*, *Oxalis tuberosus* and *corniculatus*. *Genista triacanthos*, *Anemone ranunculoides*, and many other plants are now in perfection, as is the delicate annual fern, *Gymnogramma leptophylla*. In the hedges, *Rubus fruticosus*, *Smilax nigra* and *aspera* are abundant, the two latter in fruit; *Ficaria ranunculoides* is very large; *Urtica membranacea* and *urens*, both abundant. I have not observed any other species of this genus. One of the most showy plants in the gardens at present is *Antholyza aethiopica*, which grows in large beds in damp shady situations; *Calla aethiopica* is also in great abundance and very fine. Palms, bamboos, *Dracena Draco*, and other tropical plants, also flourish in the open air."

In a subsequent letter to Dr. Neill, Mr. Trevelyan gives a full list of the plants in flower on 28th March. In this letter Mr. Trevelyan writes—"The *Cynomorium coccineum*, formerly known in medicine under the name of *fungus melitensis*, is a very common plant, very showy, and in great abundance on the roots of the shrubby *Cistus*. I hear that a company has been formed in Spain for the cultivation of the sugar-cane. Many things might be cultivated, were it not for the indolence and unenterprising nature of the people. No railroad has been commenced or determined on, and scarcely any improvements are going on in the country."

3. Dr. Balfour read a letter which he had received from Dr. Cleg-horn, a Fellow of the Society, dated Teerthully, 27th March, in which he states that since the end of October he had made a tour through the north-western division of Mysore, and collected a great number of interesting plants, especially in the western Ghats. Coloured drawings of most of them had been executed by a native (Mahratta) draughtsman who accompanied him. Specimens of many of the plants he purposes to send to the herbarium of the University of Edinburgh under the charge of the Botanical Society.

4. Dr. Balfour also read a letter from Dr. H. Giraud, also an active member of the Society, dated Bombay, 26th February. In this

letter Dr. Giraud gave an account of the Horticultural Society's garden at Bombay, of which he is Secretary, and alluded generally to the nature of the vegetation in the neighbourhood. He also noticed the mode of instruction adopted in the Medical College at Bombay, in which he lectures on Chemistry, Materia Medica and Botany.

MISCELLANEOUS.

Description of a new family and genus of Lizards from Columbia.

By J. E. GRAY, Esq., F.R.S. &c.

THIS lizard, which has just been sent me from Hamburg, forms a peculiar family intermediate between the *Chalcides* and the *Anadiadæ*, having the smooth imbedded scales of the former and the complete feet and femoral pores of the latter.

ARGALIADÆ.

Head covered with normal regular shields; cheeks, eyelid and eyebrows shielded; lower eyelid scaly, opaque; nostrils lateral, anterior, in the centre of a single nasal plate. Body subcylindrical, sides rounded, smooth. Scales in thin, smooth, imbedded, transverse series, scarcely overlapping; of the back, sides and tail four-sided, longer than broad, in alternating series; of the belly, front of vent, and under side of tail similar, but forming longitudinal series; of the throat broader than long; of the arm pits small, subirregular; of the limbs oblong, of the under side nearly granular. Limbs rather short, strong; femoral pores distinct, numerous; claws short, compressed; tail cylindrical, tapering.

Hab. Tropical America.

ARGALIA.

Like the family; toes 5.5, unequal.

Argalia marmorata. Brown, marbled with black-brown, beneath paler; throat black spotted.

Hab. Columbia. British Museum collection.

On the detection of Spirally-dotted or Scalariform Ducts, and other Vegetable Tissues in Anthracite Coal. By Prof. J. W. BAILLY, of the U. S. Military Academy.

On perusing an account of the results obtained by Schultz and Ehrenberg (Annals, vol. xvi. p. 69) in the microscopic examination of coal decarbonized by means of nitric acid and heat, I felt a desire to repeat the experiments and obtain if possible some of those "white splinters" which they found "composed of aggregated siliceous cells arranged in regular succession, of the structure of the prosenchymatous cells of wood." But just as I was about to commence the repetition of these experiments, it occurred to me that I might find the decarbonization in every stage of progress among the masses of some partially burned Pennsylvania anthracite with which a grate in my room was filled, in which the fire had been allowed to smother itself in its own ashes.

I was not disappointed, for I found that many of the masses or partly burned coal readily separated into numerous laminæ, on almost all of which, when magnified, vegetable structure could be detected, and on many of which the tissues were preserved in a state of un-hoped-for perfection.

Several varieties of structure presented themselves, the most interesting of which however were well-characterized *dotted or scalariform ducts*, in a most perfect state of preservation, and forming somewhat rectangular plates, which are often several inches long and one or more broad. These specimens, whose beauty and perfection can scarcely be exaggerated, present all the original markings of the vessels with a distinctness which leaves scarcely anything to be wished for. They may be examined either as opaque objects, in which case the silica appears in relief against the black coal, and shows the form and markings of the tubes very finely; or still more satisfactory results may be obtained by melting some inspissated Canada balsam upon a plate of glass, and while melted touching it to a surface of the coal upon which the ducts had been previously found to exist. When the balsam has hardened, the coal may be pulled off, and it will be found that it leaves fixed upon the balsam a thin layer of silica, containing perfectly preserved dotted vessels, which when viewed as transparent objects are nearly as distinct in their markings as if freshly obtained from a recent plant. I have a large number of specimens, and hope to find means to place them in the hands of all interested in such researches.

Besides the dotted vessels, which appear to be something very different from the "prosenchymatous cells of wood" obtained by Schultz, other tissues occurred, among which were small masses of woody fibre with no definite markings, also layers appearing to be composed of the cells of the epidermis of the stem of some plant, and, rarely, tracts of tissue presenting what appear to be the remains of stomata. All these require a more careful study before any very definite conclusion can be drawn from them.

A few inferences appear however to be fairly deducible from the examination already made, viz.—

1. It appears that almost every layer of the coal is composed of vegetable matter, which still retains very distinct remains of the original organic structure, and which consequently could never have been reduced to a homogeneous pulp.

2. The plants from which the coal was *chiefly* formed do not appear to have been allied either to the *Coniferae* or the ordinary Dicotyledonous or Monocotyledonous plants. Their nearest analogues must probably be sought among the Acotyledons, among which Ferns and *Lycopodiaceæ* present similar vascular bundles, composed chiefly of bothrenchymatous tissue*.

3. Even allowing for the effects of compression, it does not appear

* Since the above was written, I have observed that Ad. Brongniart, in a recent Number of the 'Annals,' maintains that *Stigmaria*, *Sigillaria* and *Lepidodendron*, as well as *Noygeruthia*, are all allied to the Gymnospermous Dicotyledons.

probable that the petioles of even the tree ferns could have furnished such large flattened plates of scalariform ducts unmixed with other tissues as are found in the coal, and which *very rarely* have any traces of fronds of ferns preserved in the same mass.

4. It is possible that the ducts in question may really have belonged to the *Stigmaria* itself. Lindley and Hutton, from the examination of a magnified section of a silicified *Stigmaria*, pronounce it to be a plant whose woody portions were entirely composed of *spiral vessels*; but their figure of these vessels, however interesting, leaves some room to suppose that *spirally dotted ducts* partly obscured by petrification might have been mistaken for true spiral vessels. [See Fossil Flora of Great Britain, vol. iii. pl. 166.] This view is confirmed by Unger, who attributes dotted ducts alike to the *Stigmaria* and the woody layers of *Lepidodendrea* and *Sigillaria* (Endl. Gen. Plant. sup. 2. pp. 5, 6).

5. Vascular bundles must certainly have extended from the scars found on the *Stigmaria* and *Sigillaria* to the deciduous appendages (see Foss. Flora, vol. i. plates 31, 32 and 33), whether these latter were leaves or radical fibres, and the partial decay of masses composed of numerous layers of such appendages would account for most of the appearances observed in the coal.

6. The proofs afforded by these examinations, that the coal is composed of layers, of great tenuity, of vegetable matters scattered in a confused manner, and that no trunks of trees or any considerable portion of their branches had anything to do with its formation, are in exact accordance with the inferences drawn by Prof. H. D. Rogers from an examination of the mechanical structure of unburned coal*.

7. As anthracite is only bituminous coal which has lost its volatile matter, the results obtained from it apply to all varieties of the true coal of the carboniferous epoch. The presence of bitumen, however, and the consequent swelling and partial fusion of the ordinary coal, render it difficult to obtain from it the tissues in the perfection in which they may be found in anthracite.

Physiological Remarks on the Statics of Fishes. By JOH. MÜLLER.

Like all animals, fishes have a very delicate sense of the equilibrium of their body; they counteract any change in this position by means of movements, partly voluntary, partly instinctive. These last are seen in a very remarkable manner in the eyes, and they are so constant, so evident in the fish as long as it lives, that their absence suffices to characterize the death of the animal.

The equilibrium of the body of a fish in the water is independent of the natatory bladder; this organ may even interfere with it. The equilibrium of the fish, its horizontal position with the back upwards, depends solely on the action of the fins, and principally on the vertical fins.

The natatory bladder may assist the fish to increase or to diminish its specific gravity. By compressing the air which is contained in

* See Transactions of the Association of American Geologists, p. 448.

it, the fish descends in the water; it rises again by relaxing the muscles which had served to compress the bladder. Moreover, the fish may remain at the bottom of the water, by the very fact of the pressure of the column of water on the air contained in the bladder.

By compressing more or less the posterior portion or the anterior portion of the bladder, the animal is able to render the anterior half or the posterior half of its body lighter at will; it can also take an oblique position, which allows a movement of rising or of descending in the water. The arrangement of the natatory bladder in some fishes might favour this action. The Cyprinoids and the Characi have two bladders, one before the other, and communicating together by a narrow tube. The anterior bladder is very elastic, whereas the posterior one is very slightly so; and in proportion as the fish rises in the water, the anterior bladder, which is the most elastic, must considerably increase in volume, and thus keep the head of the animal up, whilst the contrary must be the case when the fish descends.—*Müller's Archiv*, 1845, p. 456.

CICONIA ALBA.

A fine specimen of the Stork (*Ciconia alba*, Ray) was shot a few weeks since near Fermoy in the county of Cork. It appears that three individuals were seen, but this only was procured. It is now in the possession of the Rev. Mr. Bradshaw of this city. I am not aware of any authentic record of the species having been met with in Ireland before.

J. R. HARVEY, M.D.

Cork, June 17, 1846.

Embryogeny of the Ornithomyiæ. By M. BLANCHARD.

The *Ornithomyiæ*, or *Pupipares* of Latreille, are parasitic on mammiferæ and birds. They have for a long time attracted the attention of entomologists, by an exceptional mode of reproduction which distinguishes them from all other insects. They do not deposit eggs, nor even larvæ, like some other Diptera, but nymphs, the external envelope of which hardens in contact with the air, and from which issues a few days afterwards the perfect insect.

Anatomists are not agreed as to whether the embryos pass, in the maternal ovary, through the ordinary phases of the metamorphoses of insects. Latreille supposed that the nymphs are at first under the form of eggs, and pass their life as larvæ within the body of the mother. Leon Dufour, from examinations of the *Hippoboscus* of the horse, and the *Melophagus* of sheep, thinks, on the contrary, that the embryos of the *Ornithomyiæ* are never comparable to eggs or to larvæ.

M. Blanchard has examined the *Leptotena* of the stag, and he has found, in the ovary of the females, embryos which completely resemble the larvæ of the Diptera, by their soft teguments, their corneous head, their two long tracheæ, and their nervous system collected in the anterior part of the body. The only important difference

which he has observed is the imperfection of the alimentary canal, which in these young larvæ is not yet formed and is replaced by a mass of globules. These larvæ taking no nourishment, the intestinal canal appears to be developed more slowly; the individuals in the author's possession died too suddenly to allow him to observe this formation.—*Société Philom. de Paris*, Jan. 17th, 1846.

METEOROLOGICAL OBSERVATIONS FOR MAY 1846.

Chiswick.—May 1. Dry haze: overcast. 2. Overcast. 3. Dry haze. 4. Cloudy and fine. 5. Very fine: showers. 6. Showery: cloudy and fine. 7. Cloudy and fine. 8. Overcast: exceedingly fine: clear at night. 9. Very fine. 10. Slight rain: cloudy: clear. 11, 12. Very fine. 13. Light clouds: overcast: rain at night. 14. Clear: cold and dry. 15. Cloudless: light clouds and fine: clear and cold at night. 16. Uniformly overcast: dry haze: densely overcast at night. 17. Overcast: rain: clear. 18. Rain: cloudy boisterous. 19. Very fine: thunder-showers: densely overcast. 20. Rain: heavy showers. 21—23. Very fine. 24. Slight fog: overcast and fine. 25, 26. Very fine. 27. Cloudless: very fine: overcast. 28, 29. Very fine. 30. Hot and dry. 31. Cloudless: hot and sultry: clear.

Mean temperature of the month	56°·16
Mean temperature of May 1845	50°·04
Mean temperature of May for the last twenty years	54°·77
Average amount of rain in May	1·84 inch.

Boston.—May 1. Fine. 2—4. Cloudy. 5, 6. Fine: rain p.m. 7. Cloudy. 8, 9. Fine. 10. Cloudy: rain early a.m. 11, 12. Fine. 13. Cloudy. 14—16. Fine. 17. Cloudy: rain early a.m. 18. Cloudy: rain a.m.: thunder p.m. 19. Fine. 20. Fine: hail and rain a.m. and p.m., with thunder and lightning. 21. Cloudy. 22. Fine: rain p.m. 23, 24. Fine. 25, 26. Cloudy. 27—29. Fine. 30. Fine 3 o'clock p.m. 75°. 31. Fine.—N.B. The warmest May since 1833: it was 62°·8.

Sandwich Manse, Orkney.—May 1. Drizzle: damp. 2. Bright: clear. 3. Clear: aurora. 4. Bright: rain. 5, 6. Rain: cloudy. 7. Fine: rain. 8. Cloudy. 9. Clear: cloudy. 10. Clear: thunder and hail. 11. Bright: drops. 12. Bright: cloudy. 13, 14. Bright: fog. 15. Bright: cloudy. 16. Bright: clear. 17. Rain. 18. Fog: cloudy. 19—21. Damp: cloudy. 22. Rain: damp. 23. Showers: bright: cloudy. 24. Showers: clear. 25. Rain: cloudy. 26. Showers. 27, 28. Showers: cloudy. 29. Cloudy. 30. Rain: cloudy. 31. Cloudy: fine.

Applegarth Manse, Dumfries-shire.—May 1. Dropping day. 2. Fair and fine. 3. Fair and very fine. 4. Itain all day. 5. Heavy showers. 6. Showers. 7, 8. Fair and fine. 9. Fair and fine. a few drops p.m. 10. Heavy rain during the night. 11. Fair and fine. 12. Slight shower: growing weather. 13—16. Fair and fine. 17. Showery morning: cleared. 18. Showery all day. 19. Rain p.m. 20. Rain during the night: cleared. 21. Showers: thunder. 22. Drizzly all day. 23—25. Very fine day. 26. Very fine day: droughty. 27, 28. Very droughty. 29—31. Very warm.

Mean temperature of the month	52°·6
Mean temperature of May 1845	50°·0
Mean temperature of May for 23 years	51°·0
Mean rain in May	1·96 inches.
Mean rain in May for 18 years	1·73 „

Meteorological observations made by Mr. Thompson at the Garden of the Horticultural Society at Chiswick, near London; by Mr. Veall, at Boston; by the Rev. W. Dunbar, at Applegarth Manse, Dumfries-shire; and by the Rev. C. Clouston, at Sandwick Manse, Orkney.

Days of Month.	Barometer.				Thermometer.				Wind.			Rain.		
	Chiswick.		Dumfries-shire.		Chiswick.		Orkney, Sandwick.		Chiswick, 1 p.m.	Dumfries-shire.	Orkney, Sandwick.	Chiswick.	Dumfries-shire.	Orkney, Sandwick.
	Max.	Min.	9 a.m.	9 p.m.	94 a.m.	84 p.m.	94 a.m.	84 p.m.						
1846.														
May.														
1.	30-285	30-263	29-83	30-12	30-01	29-77	30-03	29-77	46	49	46	49	46	49
2.	30-208	30-125	29-64	30-00	30-02	29-97	29-81	29-97	46	46	46	46	46	46
3.	30-083	29-932	29-59	30-00	29-98	30-10	30-04	30-10	46	42	42	42	42	42
4.	29-866	29-721	29-50	29-80	29-60	29-87	29-03	29-87	43	43	43	43	43	43
5.	29-724	29-544	29-20	29-52	29-38	29-71	29-06	29-71	42	42	42	42	42	42
6.	29-548	29-394	29-00	29-30	29-38	29-46	29-41	29-41	45	45	45	45	45	45
7.	29-750	29-665	29-15	29-49	29-52	29-44	29-41	29-41	47	47	47	47	47	47
8.	29-931	29-730	29-35	29-67	29-80	29-82	29-62	29-82	48	48	48	48	48	48
9.	29-974	29-863	29-49	29-80	29-55	29-79	29-52	29-79	48	48	48	48	48	48
10.	29-962	29-787	29-26	29-51	29-68	29-42	29-56	29-56	48	48	48	48	48	48
11.	30-093	30-058	29-50	29-81	29-82	29-73	29-80	29-80	48	48	48	48	48	48
12.	29-994	29-836	29-49	29-85	29-85	29-77	29-87	29-87	48	48	48	48	48	48
13.	29-734	29-713	29-35	29-86	29-98	30-04	30-04	30-19	48	48	48	48	48	48
14.	29-995	29-880	29-50	30-08	30-06	30-19	30-12	30-12	48	48	48	48	48	48
15.	29-968	29-859	29-53	29-98	29-80	29-97	29-78	29-78	48	48	48	48	48	48
16.	29-695	29-360	29-29	29-67	29-40	29-74	29-68	29-68	48	48	48	48	48	48
17.	29-218	29-184	28-69	29-10	29-03	29-42	29-13	29-13	48	48	48	48	48	48
18.	29-139	29-023	28-64	28-94	28-90	29-11	29-16	29-16	48	48	48	48	48	48
19.	29-545	29-481	28-95	29-18	29-19	29-20	29-30	29-30	48	48	48	48	48	48
20.	29-558	29-444	28-96	29-12	29-34	29-32	29-56	29-56	48	48	48	48	48	48
21.	29-949	29-677	29-22	29-65	29-88	29-77	29-93	29-93	48	48	48	48	48	48
22.	30-203	30-120	29-57	30-00	30-02	29-94	30-02	29-94	48	48	48	48	48	48
23.	30-212	30-201	29-61	30-10	30-12	30-12	30-12	30-12	48	48	48	48	48	48
24.	30-232	30-202	29-67	30-12	30-11	30-04	30-07	30-07	48	48	48	48	48	48
25.	30-207	30-102	29-61	30-05	30-00	29-87	29-84	29-84	48	48	48	48	48	48
26.	30-138	30-115	29-54	30-00	30-00	29-85	29-82	29-82	48	48	48	48	48	48
27.	30-109	30-046	29-52	29-97	29-98	29-88	30-03	30-03	48	48	48	48	48	48
28.	30-243	30-153	29-63	30-10	30-15	30-12	30-17	30-17	48	48	48	48	48	48
29.	30-320	30-305	29-74	30-20	30-18	30-13	30-14	30-14	48	48	48	48	48	48
30.	30-300	30-154	29-72	30-16	30-15	30-04	30-04	30-04	48	48	48	48	48	48
31.	30-178	30-130	29-57	30-12	30-10	30-14	30-14	30-14	48	48	48	48	48	48
Mean.	29-947	29-844	29-39	29-783	29-773	29-802	29-806	29-806	48	48	48	48	48	48
									1-35	1-45	1-96	1-88		

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THE ANNALS

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IX.—*Notices of British Hypogæous Fungi.* By the Rev. M. J. BERKELEY, M.A., F.L.S., and C. E. BROOME, Esq.

SINCE the publication of the last series of notices of British Fungi (vol. xiii. p. 360), several interesting discoveries have been made amongst the hypogæous species, which it is desirable should at once be recorded. It is to be regretted that the memoir of Messrs. Tulasne has not yet been published, though presented to the Academy. Two recent opportunities however of inspecting their drawings, and the communication of many new and rare species, as also the receipt of a very complete collection of authentic specimens from Vittadini and Corda, have enabled us to ascertain some points which were previously uncertain.

Doubtless many more species will reward the continued researches in a field which is almost new to British botanists, and there is every reason to believe that the greater part of the species are pretty generally diffused. The list of indigenous species in proportion to our flora is already as large as in France or Italy. It would not be fair to omit recording the active researches of Mr. Thwaites, to whom we are indebted for many valuable observations.

I. Species SPOROPHORE.

**Hymenogaster luteus*, Vitt. Mon. Tub. p. 22. *Splanchnomyces luteus*, Corda, Fasc. 6. tab. 8. fig. 76. ined. Apethorpe, Norths, July; Rushton, Norths, Oct.

Varying somewhat in the depth of the yellow tint of the hymenium, but always easily recognised by the character of the spores.

**H. olivaceus*, Vitt. l. c. p. 24.

Our British specimens accord very exactly in the form of the spores with those of Vittadini, in which however the colour of the hymenium when dry is of a redder tinge.

Ann. & Mag. N. Hist. Vol. xviii.

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Hymenogaster olivaceus, Vitt. l. c., var. *modestus*, Berk. and Broome.

An *Hymenogaster* occurred at Hartham Park in the autumn of 1845, nearly intermediate between *H. citrinus* and *H. olivaceus*, differing from the former in being of a pale watery brown within and of a softer texture, with spores exactly intermediate between those of the two species. The scent was something like that of *H. citrinus*, but not so strong. It was not at all yellow externally, but first white, and then of a watery brown. It grew in a very dry fir-plantation, therefore its watery texture could not arise from situation, especially since *H. citrinus* occurs in much moister places without any similar appearance. We consider it best for the present to record it as a variety of *H. olivaceus*, differing in scent and in the form of the spores.

1. *H. vulgaris*, Tul. MSS. "Rotundatus, irregularis ex albidis sordidus, molliusculus; gleba primum albida dein saturate fuscescens; lacunis irregularibus majusculis, basi sterili minuta; hymenio plano; sporis oblongis vel lanceolato-oblongis acutis, basi attenuatis maturis atro-brunneis subopacis, superficie inæqualibus." *Splanchnomyces tener*, Corda, Fasc. 6. ined. tab. 8. fig. 84. *Hym. griseus*, Tul. ! Ann. d. Sc. Nat. ser. 2. vol. xiv. p. 374. Apethorpe, Norths, July 15, 1845; Leigh Wood and Stapleton Grove near Bristol, &c.

The British specimens accord exactly in form with those sent by Messrs. Tulasne, and have the spores merely apiculate and by no means acuminate. In general the internal substance changes from dirty white to pale reddish brown, and then almost to black. Sometimes however there is at first a slight tinge of pale tan. The spores are variable in form, but are never acuminate. This species was inadvertently mixed with specimens of *H. tener*, and in consequence communicated with the true *H. tener*, a very distinct species, to Messrs. Tulasne and Corda, and possibly may be substituted for it in some copies of the fourth fasciculus of British Fungi.

2. *H. pallidus*, Berk. and Broome. Parvus rotundato-depressus subglaber albus, demum sordide alutaceus molliusculus, intus ex albo pallide flavus dein dilute fuscus; basi absorbente obsoleta; peridio tenuissimo; cellulis minutis semivacuis; sporis lanceolatis acutis breviter pedicellatis asperulis, guttulis subtribus minutis; odore debili. Cotterstock, Norths, in a dry fir-plantation, Oct. 1845.

This species, which scarcely exceeds in size a horsebean, is nearly allied to the last, but differs in its more acute spores as well as in colour. A single specimen only of *H. vulgaris* has occurred in the immediate neighbourhood, *H. luteus* being the most abundant species.

3. *Hymenogaster decorus*, Tul. ! Ann. d. Sc. Nat. ser. 2. vol. xix. p. 374. Epping Forest, Hartham Park, King's Weston, Chudleigh, &c.

This is a much firmer species than *H. tener*, darker within, with larger spores; but it is especially distinguished by its elongated filiform sporophores, which project far beyond the surface of the hymenium.

4. *H. Thwaitesii*, Berk. and Broome. Parvus globosus firmus extus albidus maculis saturatoribus notatus, intus brunneus, sporis minoribus globosis, vesicula interiori sæpe contracta, scabriusculis papillatis; nucleo unico magno. Portbury, Sept. 6, 1845.

This species is proposed as new with the sanction of Messrs. Tulasne, who examined a specimen prepared in fluid by Mr. Thwaites. The spores are far more globose than in any other species, and are either quite obtuse or minutely apiculate. The inner membrane of the spores often contracts so as to present a very singular appearance. A few elongated spores are mixed with them, but the normal form is globose; indeed, except the normal form be taken into consideration, it would be impossible to draw up distinguishing technical characters of any *Hymenogaster*, as there are always some irregular spores mixed with those which are peculiar to the species. They are larger than in *H. tener*, but smaller than in *H. decorus*.

**H. tener*, Berk. Ann. of Nat. Hist. vol. xiii. p. 349. *H. argenteus*, Tul. ! Fung. Hyp. in Giorn. Bot. Ital. Ann^o. 1^o.

This is one of the most distinct species, characterized by its small, widely elliptic or subglobose spores. The synonym of Tulasne is given on the authority of its authors, and on examination of authentic specimens.

5. *H. pusillus*, Berk. and Broome. Minimus obovatus vel subdepressus albus basi sterili ampla præditus, intus albidus; cellulis pro ratione magnis; sporis pallide rubiginosis brevibus late ellipticis papillatis demum asperulis. On mossy ground in the Wilderness, Rushton, Norths, Oct. 8, 1845, with *H. luteus*.

About 2 lines high, obovate or somewhat depressed, pure white, yellowish brown when dry, and then resembling strongly a specimen of *Sclerotium complanatum*, Tode, nearly smooth; dirty white within, furnished with a large distinct absorbing base. Cavities of the hymenium large for the size of the fungus, clothed sparingly with the rust-coloured spores. Sporophores clavate, frequently forked or irregular, having two spores on rather long spicules. Spores short, minute, broadly elliptic, at first smooth, at length rather rough, obtusely apiculate.

This species, which has no particular odour, has at present occurred very sparingly. Its nearest ally is *H. tener*, but the

cavities of the hymenium are larger ; it is almost without scent, and there is not the slightest tendency to become black in drying. There is little difference in the form or size of the spores.

6. *Octaviana asterosperma*, Vitt. ! Mon. Tub. p. 17 ; Tul. ! Ann. d. Sc. Nat. l. c. p. 376 ; Corda, Ic. Fasc. 6. tab. 7. fig. 6-1. (ined.) Leigh Wood near Bristol ; Chudleigh, Devon.

This very interesting addition to our flora has at present occurred very sparingly. The smell, as observed at the latter locality, was just like the pungent odour of some *Ichneumon* or small bee.

It is probable that *Hydnangium Stephensii* really belongs to this genus, and that *H. carotæcolor* is a true *Hydnangium*. The structure of the trama is very different, in the former resembling that of an *Agaric*, in the latter that of a *Russula*.

In *Hydn. carotæcolor* the colouring matter consists of oil globules. It is probable that it is from the gradual escape of these from the dry plant, that the paper to which they are attached, or with which they chance to be in contact, is stained with lemon-colour. Externally it is of a more decided yellow, free from any tinge of orange and paler than the fructifying mass. Each sporophore in this species usually bears four spores ; in *H. Stephensii* one only.

**Rhizopogon rubescens*, Tul. ! Fung. Hyp. in Giorn. Bot. Ital. An^o. 1^o. *Melanogaster Berkeleianus*, Broome ! Ann. Nat. Hist. vol. xv. p. 41.

This species occurred last year abundantly at Chudleigh, and appears to be certainly the same with the species of Tulasne. *Hysteromyces graveolens*, Vitt., of which authentic specimens have been kindly communicated, is probably also the same species, as is also the case with *Rhizopogon luteolus* and *R. virens* from Italy, *Hymenangium virens*, Kl., *Rhizopogon luteolus*, Corda, and perhaps with *Rhiz. luteolus*, Fr.

This species grows gregariously in sandy fir-woods. When young it is almost transparent, and resembles young *Phallus caninus*, being of a pure white and furnished with white roots which proceed from a mycelium which spreads sometimes an inch or two ; in this state it turns pink on being touched ; in a more advanced stage it is yellow, but even then it has here and there a pink tinge. The smell is very much like that of *Melanogaster ambigua* when old, but when young it has an acid smell like that of sour ham. It rapidly decays into a brown fetid pulpy mass.

II. Species SPORIDIIFERÆ.

7. *Genea papillosa*, Vitt. l. c. p. 28. Near Chudleigh, Aspley Beds, and Bristol.

This species, which appears to be but little known and very rare in Italy,—for there is no authentic specimen in any of the

collections which have been distributed by Vittadini, as far as we have been able to ascertain,—has lately occurred abundantly in the neighbourhood of Bristol, and is far more distinct from *G. verrucosa* than would be inferred from the name or description. The whole peridium is of a rich brown, and is densely clothed with brown bristles wherever it extends. The sporidia are very much larger and far more coarsely granulated, the granules indeed being often bifid. The single specimen from Bowood formerly referred to this species, is now ascertained, on comparison of authentic specimens, to be the same with *G. verrucosa*, Vitt., the specimens communicated under that name by Klotzsch and figured in the 'Flora Regni Borussici' differing materially from the Italian species. The sporidia of *G. papillosa* often contain two nuclei, but sometimes there is but one*.

* We take this opportunity of describing two new *Peziza* remarkable for their globose, tuberculate or echinulate spores, the first of them being remarkably analogous to *Genea verrucosa*.

Peziza (Aleuria, Helv.) radula, Berk. and Broome. Magna cupulæformis sessilis demum depressa externe verrucis subæqualibus exasperata atra, intus vinoso-fusca; sporidiis globosis tuberculatis. On the ground in woods near Bristol.

Cup depressed, sessile, nearly an inch across, black externally, broken into nearly equal distinct subconical warts like those of *Genea verrucosa*. Hymenium of a dark vinous brown. Asci large, obtuse; sporidia large, globose, containing a single nucleus rough with obtuse distinct tubercles; paraphyses septate with the ultimate articulation clavate.

This species has externally a close resemblance to a crushed specimen of *Genea verrucosa* or *Klotzschii*, and singularly enough, the sporidia are somewhat similar, though differing in size. The hymenium however is naked, not to mention other points. *Pez. bufonia*, Pers., appears closely to resemble it, but that is described as substipitate and of a bright red-brown, and we have no information as to its sporidia. Messrs. Tulasne have sent a verrucose *Peziza* which is almost closed, and covered with hairs like *Genea papillosa*, but with elliptic smooth sporidia.

P. (Lachnea, Sarc.) trechispora, Berk. and Broome. Depressa, planiuscula aurantio-miniata extus pilis pallido-fulvis vestita; sporidiis globosis echinatis. On the naked ground in woods or on the sloping wet banks of rivulets. King's Cliffe, Bristol, &c. Mons. Léveillé has sent the same species from Montmorency.

Cup $\frac{1}{2}$ rd of an inch or more broad, depressed or slightly concave, orange, paler externally and clothed with rather rigid tawny bristles. Asci elongated. Sporidia globose, sharply tuberculate. Paraphyses very slender, linear.

This species is no doubt frequently confounded with *Pez. scutellata*, which it resembles very closely, though distinguished at once by its very different sporidia, those of the allied species being smooth, much smaller, broadly elliptic with a single nucleus. There is no analysis extant of *Pez. umbrosa*; it is therefore impossible without authentic specimens to say how far it resembles that species. *Pez. scutellata* grows we believe invariably on rotten wood.

Mr. Thwaites has found another species with echinulate sporidia, but belonging to the same series with *P. repanda*. *P. phlyctospora*, Mont., and *P. aurantia* have also rough sporidia.

8. *Genea verrucosa*, Vitt. ! *l. c.* p. 28. Bowood Park, King's Cliffe.

This is distinguished from the species of Klotzsch by the more minute sporidia, their minor axis being only half the size of that in the following species. Two specimens only have at present occurred in England, the remainder belonging to *G. Klotzschii*, and one perhaps to *Genea sphaerica*, Tul., but on this further information is desirable. In all the species the sporidia when seen laterally are really elliptic. *Genea bombycina* is now referred by Messrs. Tulasne to a new genus which they have named *Stephensia*. The true locality of this species is Castle Combe: it has also been found at Chudleigh.

9. *G. Klotzschii*, Berk. and Broome. Foetida; peridio subplicato intruso extus intusque verrucoso nigro; subtus fibrillis radican-tibus parvis rigidiusculis fuscis affixo; mycelio effuso candido aranoso-contexto; sporidiis majoribus tuberculatis. *G. verrucosa*, Kl. ! *Fl. Regn. Bor.* no. 474. *Hydnocaryon fragrans*, Wall. ! *Fl. Crypt. Germ.* p. 86. Abundant in the neighbourhood of Bristol and in Devonshire.

The mycelium spreads for some distance on or within the soil, so that the plant is easily detected when the leaves are raked off. This vanishes when the peridia are perfect. One or more individuals are found in each patch of mycelium. In the young peridium the point of attachment is lateral, as in the eggs of some insects and in some specimens of *Pachyphlaeus melanozanthus*. The sporidia are large, coarsely granulated, and much exceeding in volume those of *G. verrucosa*, which does not seem to have the same kind of mycelium; at least no notice of it is taken by Vittadini.

10. *Hydnobolites cerebriformis*, Tul. ! *Ann. d. Sc. Nat. l. c.* p. 379. Abundant about Bristol, Aug., Sept.; Pangbourne, Wilts.

This is a small species resembling a small lacunose truffle, but differs in having no real peridium, as is the case with the genus now to be described.

Hydnotrya, Berk. and Broome. Peridium nullum; substantia carnosa compacta similis extus anfractuosa exarata, intus sinus serpentinis magnis fungi ad superficiem apertis varie pertusa filamentis flexuosis mollibus brevibus vestitis. Asci elongati lineares obtusi substantia laxa cellulosa serie unica nidulantes, sporidia octo sphaerica reticulata sed non echinata foventes. Fungi globosi, edules.

**H. Tulasnei*, Berk. and Broome. *Hydnobolites Tulasnei*, Berk. *Ann. of Nat. Hist.* vol. xiii. p. 357.

Fine individuals of this species, 2 inches or more in diameter, have been found at Chudleigh. Having now had an opportu-

nity of examining fresh specimens of *Hydnobolites*, it appears that our truffle does not belong to the same genus; the asci of the one being very short and sacciform, of the other linear and disposed in a single row; the sporidia in *Hydnotrya* moreover are not echinulate.

Corda has communicated a species under the name of *Hydnobolites carneus*, which is eaten in great quantities at Prague under the name of *Czerwena Tartoffle*. We do not know how he distinguishes it as a species.

11. *Sphærosoma ostiolatum*, Tul. MSS. Near Bristol, under leaves amongst loose mould.

Only two or three individuals of this curious production have been met with. One was quite young and resembled very closely authentic specimens of *Sphærosoma fuscum*, Klotzsch, but differing in having a cavity within round a central core. The adult plant, instead of being subglobose, nearly even and of a washy brown, is strongly plicate and of a rich mulberry-brown. Klotzsch appears to have seen his species in every stage of growth; we have no hesitation then in considering ours as distinct. It is possible too that it may not be the same as that of Tulasne, but at any rate it agrees in general appearance, and we have not sufficient materials to speak decidedly.

There is not the least trace of peridium in any stage of growth, the genus being to the sporidiferous series precisely what *Guaterria* (the analogue of *Sparassis*) is to the sporophorous.

A very curious circumstance sometimes occurs, viz. that there is more than one stratum of hymenium. I know of no similar instance in sporidiferous fungi. The asci are much shorter than the paraphyses.

* *Pachyphlæus melanoxanthus*, Tul. Fung. Hyp. l.c. *Choiromyces melanoxanthus*, Tul. and Berk. Ann. and Mag. of Nat. Hist. vol. xiii. p. 359.

This species has occurred at King's Cliffe near Bristol and in Devonshire since its first publication, and is probably generally diffused. The peridium is black in every stage of growth. The genus is very properly separated from *Choiromyces*, with which it does not at all agree in habit. We have the pleasure of adding two new species.

12. *P. citrinus*, Berk. and Broome. Subglobose verruculosus peridio fusco citrino-pruinato apice vivide citrino, intus flavidus interstitiis citrinis floccosis, basi radicante. In woods near Bristol, Wiltshire and Devonshire.

Very nearly allied to *P. melanoxanthus*, which is however black in every stage of growth, and has but little odour, whereas *P. citrinus* is densely powdered with lemon-coloured particles, and has a strong smell like that of rotting sea-weed. The orifice is ge-

nerally more expanded, and is of a fine deep lemon-yellow from the exposure of the interstices of the fructifying veins, and the peridium thin and brown frosted with yellow, when young of a uniform gamboge-yellow. In *P. melanozanthus* the veins are nearly black with yellowish interstices, and the peridium thick, far more coarsely warted, more compressed and irregular in form and always black. The specimens received from Messrs. Tulasne under the name of *P. melanozanthus* are all the foregoing species, but it is probable that their characters were drawn up from both species, judging from their sketches of the fresh truffle.

P. melanozanthus is often attached laterally to leaves, sticks, &c. without any connexion with the ground.

13. *Pachyphlæus conglomeratus*, Berk. and Broome. Irregularis lobato-plicatus conglomeratus lævis, peridio fusco-rufo hic illic præsertim interstitiis adpressim sericeo-fibroso citrino. Near Bristol, October 22, 1845.

About an inch in diameter, shortly stipitate, much-lobed and plicate as if made up of a number of individuals, the lobes rounded, of a deep brown olive. Sometimes quite even, sometimes rather rough, but not the least verrucose; interstices of the lobes clothed with adpressed silky yellow fibres. Asci clavate, irregular, containing eight globose tuberculate sporidia. Sporidia larger than in the other species and differing in their appearance.

Very few individuals of this species have at present been found, but it differs very much in habit and in the total absence of tubercles or warts on the peridium*.

14. *Choiromyces mæandriiformis*, Vitt. ! Mon. Tub. p. 51. tab. 2. fig. 1. *Tuber album*, Sow. ! tab. 310.

The original specimens of *Tuber album*, Sow., still remain in the herbarium, and are identical with the species of Vittadini just cited. Unfortunately no locality is indicated on the paper to which the specimens are attached, or in the text. It has not yet occurred in the extensive researches made in Wiltshire and Somersetshire.

**Tuber brumale*, Vitt. ! Mon. p. 37.

The specimens formerly referred to *T. melanosporum* belong to this species, as appears on the inspection of a series of specimens of *T. melanosporum* obtained at Paris in January, where it is the species usually exposed for sale in winter.

15. *T. dryophilum*, Tul. ! Fung. Hyp. l. c. King's Cliffe, Chudleigh, Bristol, &c.

The species referred to *T. dryophilum*, on an inspection of authentic specimens and comparison of the sporidia, is decidedly

* The specimens began to dissolve away after being kept two days, whereas the other species will keep well for a week, nor do they then dissolve. The flesh is filled with oil globules.

gregarious with little odour, rounded, usually about the size of a nutmeg, nearly smooth, white, marked here and there with darker patches. The peridium is thick, hard and tough, easily parting from the flesh, which is firm, reddish brown, with white interstices which are given off from different points of the surface. The sporidia are elliptic and coarsely reticulato-echinulate.

16. *Tuber puberulum*, Berk. and Broome. Irregularare sublobatum album, pilis rectis brevibus puberulum dein rufo-albidum hic illic albo-maculatum; peridio subtenui, venis albis e basi radiantibus pulpa fructifera gilva denium rufo-brunnea; sporidiis subglobosis reticulato-echinatis; odore raphanoideo. Abundant in the neighbourhood of Hanham near Bristol, Chudleigh, Aspley near Woburn, in sandy districts.

Gregarious; clothed with short, erect down, which gives it to the naked eye a peculiar pearly appearance. The white spots are very visible even in dried specimens. Peridium very thin and delicate, so that the pinky brown colour of the flesh is apparent through it, often cracked. In some individuals the veins are very few. Sporidia more nearly spherical than in any species we have had an opportunity of examining.

17. *Elaphomyces anthracinus*, Vitt. l. c. p. 66. Leigh Wood near Bristol. A single specimen only in clayey soil.

The original specimens of Vittadini are minutely granulated under a lens, a character which does not appear in our specimen. The sporidia are alike and at once distinguish it from *E. maculatus*, the only species with which it can be confounded. The smell is very powerful, in which respect again it does not agree with Vittadini's species. It is indeed probable that it will prove new, but on the authority of a single individual, not in very good condition, it would be rash to do more than indicate its nearest affinity. The outer rind in the specimen when gathered was black, the inner of a dull yellowish white.

III. Species VESICULIFERÆ.

18. *Endogone pisiformis*, Lk. Diss. i. p. 33; Fr. Syst. Myc. vol. ii. p. 297. *Glomus macrocarpus*, Tul. ! Fung. Hyp. l. c. Amongst moss and in the superficial soil. Bristol, Bowood, Chudleigh, &c. Under beech and larch, and in the oak and hazel woods.

In a young state it is hard, when old less compact and granulated. The vesicles are almost visible to the naked eye. A single specimen of some allied species with the vesicles in the young state far larger and connected with each other by short filaments, occurred at King's Cliffe in July 1845.

19. *E. lactiflua*, Berk. and Broome. Irregularis depresso-globosa alba dein sordide incarnata, foetida, intus lacte crasso isa-

bellino repleta ; vesiculis nudo oculo distinctis. Chudleigh, October 1845.

Globose, at length depressed, half an inch in diameter ; at first white, but soon, especially when rubbed, assuming a reddish tinge, pouring out when cut a rich pale red cream-like fluid. Sporangia as large as those of *Endogone pisiformis*. A very distinct and interesting species.

X.—*On the Regular Arrangement of Crystals in certain Organs of Plants.* By EDWIN J. QUEKETT, F.L.S.

It rarely happens in plants that any definite organ is the seat of crystalline collections symmetrically arranged, though the occurrence of crystals (raphides) in the cells of various portions of a vegetable is extremely common.

About two years since I met with two organs which exhibit the singular fact, that in them at least the crystals are constant and have a regular arrangement.

One of these is the testa of the seed of *Ulmus campestris*, in which the sinuous boundaries of the compressed cells of which it is composed are completely traced out by minute rectangular crystals adhering to their walls. The other is much more remarkable, because, as far as I have been enabled to carry my observations, every member of two allied natural orders have very much the same disposition of these bodies in the same organ.

If a sepal of any of the ordinary cultivated *Pelargoniums* be taken, and a portion of the upper cuticle be removed and submitted to the microscope, or if the entire sepal of *Geranium Robertianum* or *lucidum* be similarly used, it will be readily seen, by magnifying 300 times, that every cell beneath the cuticular layer is small and round, and in each is a cluster of crystals (conglomerate raphides), each crystal in the group radiating from a common centre.

These crystals fill the whole of the cells in the middle of the sepal, and do so likewise all the cells until within a short distance of the margin, where they are absent and the border is transparent; the appearance they present is very beautiful and their numbers and regularity most extraordinary. Their size is about the $\frac{1}{2000}$ th to $\frac{1}{1300}$ th of an inch, and their composition appears to be oxalate of lime ; they are insoluble in boiling water, but are soluble without effervescence in nitric acid, but after being heated red-hot are soluble with effervescence.

I have found them in all the species of British *Geranium* and *Erodium*, and in all the species of *Pelargonium* and *Monsonia* (for which plant I am indebted to Mr. J. Smith of Kew) that I have been enabled to obtain ; and it is not improbable that they

may occur in all the species, and may be as general a character of the order as the beautiful markings in the cuticle of the petals are well known to be.

Other orders have been examined which are said to have a near affinity with *Geraniaceæ*, but none of the plants examined, belonging to the orders *Balsaminaceæ*, *Tropæulaceæ*, *Oxalidaceæ* or *Linaceæ*, manifest anything like the appearances described—in fact no clustered crystals have been met with; but in taking an order said to be somewhat more remote, *Malvaceæ*, I find in all the examples that I have examined of British and foreign plants, precisely a similar disposition and number of crystals.

If the leaves constituting the involucre of *Althæa*, *Malva* and *Pelargonium* be carefully examined, a few crystals will occasionally be found, but altogether not in the slightest to be compared with the number or disposition of those in the sepals.

If constitutional peculiarities, besides structure, have any influence with systematists, then *Malvaceæ* ought probably to be placed somewhat nearer *Geraniaceæ*; and when we consider the monadelphous condition of the stamens of both orders and their tendency in *Monsonia* to be indefinite, and the carpels of some plants of *Malvaceæ* to have but one seed, exalbuminous, and to be disunited, and the parts of the flower of the same numbers, there appears to be some reason, as far as the structure of the reproductive organs is concerned, to bring the position of these orders in closer relation.

The sepals of most plants are favourable organs for meeting with crystalline bodies, either of the solitary, acicular or clustered varieties. The sepals of *Prunella vulgaris* and *Dianthus caryophyllus* exhibit well the solitary cubic crystal beneath the cuticular cells; the Fuchsias contain a great quantity of the acicular kind, and the sepals of the Strawberry exhibit the clustered variety as seen in the *Geraniaceæ*. Thus it appears that there is something peculiar to the sepals of certain plants that disposes the contents of their cells to form crystals which does not belong to the neighbouring organs.

50 Wellclose Square, July 4, 1846.

XI.—*Remarks on certain Genera belonging to the Class Palliobranchiata.* By WILLIAM KING, Curator of the Museum of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne.

[Continued from p. 42.]

PENTAMERUS.

THE beak of *Pentamerus* is furnished with an aperture of the form of a triangle, the base of which corresponds to the hinge

line, and the apex to the rostral point. Owing to the great incurvation of the beak in some species (*P. Knightii*), the aperture is concealed, except in the young state; but other species (*P. conchidium*), in which the beak is slightly incurved, have it exposed during their entire existence. Nothing more need be said to show that the aperture is the same as the open deltidium of *Spirifer*, &c. From the sides of the deltidium two plates extend to within a quarter of their length of the frontal margins of the shell, at the same time decreasing in depth and gradually becoming more and more separated from the roof of the valve to which they belong, till their extremity, which is reduced to a mere point, is within an eighth of their length of the inner surface or floor of the opposite valve (*P. conchidium*). Both plates are conjoined superiorly throughout their entire length; and as they follow the curve of the upper valve, though somewhat more sharply, they form as it were a longitudinally curved arch-shaped process, which strongly resembles the upper mandible of a parrot, supposing the base of the mandible to be attached to the sides of the deltidium. At their point of attachment to the cardinal margin, the plates are thickened, or rather converted into two condyles, which fit into a pair of sockets excavated in the corresponding part of the opposite valve: in this mode of articulation, *Pentamerus* agrees with all the dentigerous palliobranchiate genera.

Owing to the different degrees of incurvation of the beak in different species, the arch at its posterior end, that is, where the plates are attached to the sides of the deltidium, presents some widely different appearances: thus in *Pentamerus galeatus*, in which the beak curves so much downwards as actually to overlap the *natis* of the opposite valve to some extent, the arch, from the condyles to the rostral point or apex of the umbone, is doubled up as it were; whereas in *Pentamerus conchidium*, in which the beak extends considerably behind the hinge line, the corresponding part of the arch is completely unfolded.

Besides being connected with the sides of the deltidium, the arch is attached to the medio-longitudinal line of the roof of the dorsal valve by means of a vertical plate extending along its crest, from the posterior to nearly the anterior extremity. The length and depth of this plate vary according to species: in *P. conchidium* and *P. Knightii*, its superior margin embraces the posterior three-fourths of the length of the shell; but in *P. galeatus* and *P. bashkircus* it extends no further than the centre; and as the arch falls lower in *P. Knightii* and *P. galeatus* than in *P. conchidium* and *P. bashkircus*, this plate is consequently deeper in the former than in the latter.

The ventral valve (of *Pentamerus galeatus*) is furnished with

two outwardly-inclined plates extending from the *socket-walls* to the centre, a distance exceeding, by one-fourth of their length, the anterior extremity of the arch. Both plates are attached to the inside or floor of the valve, at a little distance from each other, nearly their entire length, gradually increasing in height and becoming more divaricated as they advance. Looking down upon the plates, their posterior half is seen at first, that is, commencing from the floor of the valve, leaning outward, then to turn inward, and again to turn outward; this brings their superior margin nearly in contact with the postero-lateral margin of the valve to which they are attached: their anterior half is simply inclined outward at first, and then inward; the difference being caused by the absence of the superior everted portion, which, decreasing in depth somewhat rapidly in its progress, is not carried beyond the middle of the plate: in *Pentamerus Knightii* the superior eversion is carried much further forward, and it appears to be the same in *P. conchidium*.

Although there is considerable dissimilarity between *Pentamerus* and other palliobranchiate genera, yet I cannot agree to the amount of difference contended for by M. Verneuil, who recognises little or no identity between the parts composing the internal apparatus of the former, and those entering into the composition of its homologue in the latter*.

In the first place let us consider the arch of *Pentamerus*. The position of the plates composing this arch, relatively to the deltidium, and their subserviency to articulation, place beyond doubt their strict identity with the condyle plates of other Palliobranchs. This view was first advanced by Von Buch, from an examination of *Pentamerus conchidium*†. In *Productus*, &c. the condyle plates are never seen; in *Terebratula* they are only partially present; while in *Spirifer*, *Atrypa*, *Hypothyris* and *Orthis*‡, they are rarely absent. In those shells which are provided with them, the position of the condyle plates relatively to each other is often very different: in many *Orthises*, *Atrypas*, *Hypothyrises* and certain *Terebratulas* (*T. elongata* and *T. hastata*), they vary slightly from the perpendicular; in certain *Orthises* (*O. eximius*, *O. crenistria*, &c.), and most of the *Spirifers*, they strongly incline towards each other superiorly, but without coming in contact; in *Spirifer heteroclitus*, *Orthis adscendens*, *Uncites Gryphus*§,

* Geology of Russia, vol. ii. pp. 107, 108 and 109.

† Ueber Delthyris, &c.

‡ The condyle plates are rudimentary in *Orthis senilis*, *O. Wangenheimi*, &c. The peculiar twist of the umbone in *O. senilis*, &c. is probably owing to the absence of the condyle plates.

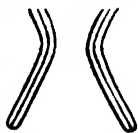
§ This singular shell has the condyle plates forming a remarkably flat-

Atrypa undata, and in the Camerophorias, they curve in and conjoin at their upper margin so as to form an arch more or less resembling that of *Pentamerus*.

With reference to the suspending plate of the *Pentamerus*, its position, and its connexion with the arch or condyle plates, establish its identity with the mesial plate, which serves to distinguish certain genera and certain species. In *Spirifer cristatus*, *S. Walcottii*, *S. rostratus*, Zeilen, *Martinia imbricata*, &c., this plate, which is large, is situated between and independent of the condyle plates; in *Strigocephalus* it is a well-known internal appendage; in *Spirifer heteroclitus* it is largely developed in comparison with the condyle plates, which are cemented to the lower part of its sides; in *Orthis adscendens* and the Camerophorias it is comparatively small, and attached to the crest of the arch as in *Pentamerus*; in certain *Orthises*, and in the *Lep-tænas*, it exists under a rudimentary form, projecting a little below the central line of their remarkably flattened arch-shaped process*.

tened arch, separated from the roof of the deltidial valve as in *Pentamerus conchidium*, but not suspended as in this species by a mesial plate. The arch is so flat and the *natis* of the opposite valve passes so close up to its under surface, especially in old specimens, as to leave little or no opening for a pedicle; indeed I suspect that this part only belonged to young individuals. I am not acquainted with the armature of the opposite valve of *Uncites*, it is therefore difficult for me to form any positive conclusion as to its generic affinities. In the synoptical table it is placed in the family *Terebratulidæ*, on account of its resemblance to *Pentamerus conchidium* in a few particulars.

* The most remarkable internal structure that I know of is to be seen in the dorsal valve of a shell labelled "*Terebratula concentrica* from the Eifel," specimens of which I owe to the kindness of M. de Verneuil and Mr. W. R. Loftus. In this species the condyle plates are attached to a process, which, to use a homely comparison, resembles a shoe-lifter. Imagine a process of this kind, about a third of the length of the shell, with its narrow end fitting into the rostral point, and its lateral margins attached to the inside of the dorsal valve along its medio-longitudinal region; then imagine the superior margin of the condyle plates attached to its under or convex surface, one on each of, and along, its sides, and a tolerably correct idea will be formed of this singular apophysis. To complete the internal structure of this shell, I may add that its lower valve is furnished with a deep mesial plate, which supports a concave crural base, and that it possesses a pair of spiral appendages,—the latter character added to its external form is in favour of this shell belonging to *Atrypa*: whether it should be made to form another genus I am not at present prepared to offer a positive opinion. Notwithstanding its dissimilarity to all other known *Palliobranchs* in its internal structure, I am led to suppose that the apparatus of the dorsal valve of this species is a modification of those condyle plates (in many *Spirifers*) which are drawn in towards each other at their superior half as here represented: what is required to convert such a pair of condyle plates into the apophysis of *Atrypa concentrica* is the approximating parts



The plates of the ventral valve, as they are prolongations of the socket-walls, must be considered as identical with the socket-plates to be seen in certain palæozoic species, as *Orthis eximia*, *Spirifer cristatus*, *S. striolatus*, Meckl., *Hypothyris*? (*Terebratula*) *nucella*, &c., and which are characteristic of that singular Silurian group described by Pander under the name of *Porambonites*.

It requires to be mentioned, that in a great many of the shells lately cited, I have cleaved the plates of the dorsal valve in the same manner as it is usual to divide those of *Pentamerus*, which proves that they are composed of two united lamellæ. M. Verneuil seems to be of opinion, that it is in *Pentamerus* alone that the plates (at least the mesial one) possess a bilamellar structure, and that this shell is therefore essentially distinguished from all other palliobranchiate genera. In some of the shells that I have broken up, the lamellæ separate as freely as those of *Pentamerus*; in most they are not quite so easily divided, and in a few there is some difficulty in separating them; the difference, it is highly probable, being simply due to the more or less intimate union of the two lamellæ of which they are composed.

STRIGOCEPHALUS.

This genus possesses an area furnished with a deltidium, which is open in young individuals and cicatrized in those fully grown; in individuals of an intermediate age, the cicatrix exhibits a small circular opening, which resembles the entire subapical foramen of *Hypothyris obsoleta*, &c.

The inside of the dorsal valve is furnished with a mesial plate, resembling that which suspends the arch in *Pentamerus*: it extends from the umbonal cavity to within a third of its length of the anterior margin of the valve, increasing in depth as it advances. With the exception of two slight ridges running into the condyles, there is no other vestige of an arch-shaped process.

In the ventral valve, a massive slightly curved process (the concave side being upwards) stretches from the middle of the hinge to a little behind the centre of the opposite valve, where it clasps as it were the mesial plate by means of a bifurcated extremity; in other terms, this extremity is notched, which actually enables the process to pass to a little more than an

to become confluent as in this diagram, which represents a transverse section of the apparatus enlarged. Another modification of the condyle plates is to be seen in *Spirifer mosquensis* and *S. rostratus* (that is, the Jurassic shell so named by Zeilen), which have them so much prolonged as nearly to touch the frontal margin of the valve to which they are attached. (Vide Geology of Russia, vol. ii. for the former species, and Von Buch on *Delthyris* for the latter.)



eighth of an inch of the inner surface of the dorsal valve, leaving thereby just sufficient space for the thickness of the animal's mantle. I am not aware that any opinion has been hazarded on the use of this singular process; there is every reason to believe however, from the remarkable modifications which the cardinal muscular fulcrum occasionally undergoes, that both are strictly homologous. In some fossil *Terebratulas* the cardinal muscular support is erect and unusually elongated, particularly in a cretaceous species, probably *T. pectiniformis*; it appears to be the same in *Orthis eximia*, Vern.; and in the existing *Terebratula rosea* it is very much lengthened, but situated on an elevation rising out of an excessively dilated cardinal plate.

In the hinge of the same valve are situated two depressions or sockets for the condyles of the dorsal valve, one on each side of the cardinal muscular support: the socket-walls are very much expanded laterally, so as to form two prominent plates, which descend, curving in towards each other at the same time, to a little below the origin of the cardinal muscular support, where they nearly touch a slightly elevated vertical plate, which stretches to about half-way along the medio-longitudinal line of the valve. Their origin and position, and the peculiarity next to be described, are highly in favour of these plates constituting a divided crural base*. Each of the crural plates, on its lower part, gives off a slender lamelliform process, which curves (the concave side upwards) towards the anterior end of the mesial plate of the dorsal valve, but a little to one side of it; the process now makes a sudden bend upon itself, curves downwards and postero-laterally, till it nearly touches the end of the cardinal line; here it makes a sharp forward curve, runs along the side, and afterwards along the front of the valves, at the distance of a quarter of an inch from their margin, to nearly the medio-longitudinal line of the shell; further I have not been able to trace it. This is the course of both processes: they thus form two symmetrical subgyrate appendages, which remind one of the spiral coils of the Spirifers and the folded loop of the Terebratulas. It is to be hoped that sufficient has been adduced to show the generic difference between *Strigocephalus* and *Pentamerus*, which has occasionally been doubted†. The difference is such as to induce me to place the former in the family *Spiri-*

* This view is further supported by the striking resemblance which these plates bear to the concave crural base of *Martinia* (*Terebratula*) *hyalina*, Buch. This species is interesting in another point of view, as from its external resemblance to *Strigocephalus*, we are warranted in supposing that both are intimately related to each other, although belonging to separate genera.

† "The difference between *Strigocephalus* and *Pentamerus* appears to me not very important."—Phillips, Palæozoic Fossils of Cornwall, &c., p. 55.

feridæ, and the latter in that of *Terebratulidæ*. Besides its subgyrate processes and its deltidium (which when the shell is young has precisely the character of that of the *Spirifer*s), its close resemblance to *Martinia* (*Terebratula*) *hyalina*, Buch, both as regard external characters and the crural base, are eminently in favour of *Strigocephalus* belonging to the *Spiriferidæ*; and the probability is even great that it is directly allied to the genus *Martinia*.

CAMEROPHORIA.

Some years ago I was struck with the remarkable difference between the casts of a magnesian limestone *Terebratula* and those of every other species with which I was then acquainted. Judging from casts of the dorsal valve of the latter, it was obvious that the umbonal cavity had been either furnished with two vertical condyle plates, generally divaricating as they passed from the beak, or unprovided with any kind of armature; but in the former there had evidently been an arch-shaped process, suspended from the roof of the umbonal cavity by a shallow plate. The contrast between casts of the magnesian limestone shell and of certain carboniferous species (*Hypothyris pleurodon*, *H. pugnus*, &c.) closely allied to it by external characters, was particularly striking. In 1840 Dr. Goldfuss kindly favoured me with some casts of a fossil labelled "*Pentamerus Knightii* from Hohenzolen," when I was immediately struck with their resemblance to the magnesian limestone species, which I at once concluded to be a *Pentamerus*; but on a further comparison I became convinced that there was a decided difference between them in the apophysis of the ventral valve. M. Verneuil also appears to have been at first led to suppose that the magnesian limestone shell, specimens of which he collected in Russia, was a *Pentamerus*; but though M. Verneuil and myself are now satisfied that this was an error, we differ in opinion as to the value of the *internal structure* which belongs to the shell in question: M. Verneuil considers it not sufficiently marked to form a generic character; while I am led to believe that it ought to be regarded as diagnostic of a new genus, for which the name *Camerophoria* is proposed.

Having, by the examination of a large number of specimens of the typical species (*C.* [*Terebratula*] *Schlotheimi*) in various states of preservation, satisfied myself regarding the internal characters of *Camerophoria*, I will now proceed to describe them with reference to their generic value.

The upper or rostral valve possesses a deltidium, which is open and only exposed in young individuals; in old ones it becomes dilated at its base, and is then occupied by the umbone of the

opposite valve, as in *Pentamerus galeatus*. Two condyle plates pass from the deltidium, one on each side of it, to a third of the length of the shell; they conjoin at their superior margin, so as to form an arch-shaped process, the crest of which is attached to the roof of the valve by means of a shallow vertical plate. In no respect do these plates differ from those composing the arch and its support in *Pentamerus*, except in degree.

In the ventral valve, the space between the socket-walls is occupied with a triangular horizontal plate or platform, having two of its margins attached to the hinge, and the other one free and facing the cavity of the shell. Upon the platform is situated a rounded protuberance, which from its position and the lines or striæ on its surface, is evidently the cardinal muscular support. From the free margin of the platform arise two slender filiform processes (one on each side of and close to its centre), which curving upwards pass to the anterior end of the arch, just within touching it. Immediately below these processes, a much larger one is seen to originate, and to project with a slight upward curve nearly to the centre of the shell, and within a third of its own length of the opposite valve: it becomes considerably dilated towards its free extremity, and is concave superiorly, which gives it a spoon-shaped appearance. This process is supported by a deep vertical plate extending from the under side of the platform to a considerable distance along the medio-longitudinal line of the shell.

On comparing the armature of the dorsal valve of *Camerophoria* with that of the corresponding valve of *Pentamerus*, the strongest resemblance is visible; but as the arch and its support are occasionally seen in other genera, they cannot be considered of much value in a generic point of view: if however our attention be directed to the ventral valve, we observe a structure which cannot be disposed of so summarily. In *Pentamerus* the separation of the two socket-plates at their base is such as to afford room for the attachment of the inferior terminations of the valvular muscles to the inner surface of the lower valve. In *Camerophoria* however I am convinced that these muscles were not so attached, but that they were supported by the projecting spoon-shaped process. The reasons for this view are, that no muscular impressions are visible on the inner surface of the ventral valve; that where they only can occur, the surface is crowded with vascular impressions; and that in *Hypothyris*, an allied genus, several species (*H. acuminatus*, *H. pugnus*, &c.) exhibit the muscular impressions on *that part* of the inner surface of the ventral valve corresponding to the place in *Camerophoria* which is overspread by the spoon-shaped process. Has a valvular muscular support, in the form of a projecting process, ever been

seen in the ventral valve of any other Palliobranchiate genus? As far as my own observations extend, I have not yet become acquainted with a single instance of the kind.

M. Verneuil's principal reason for maintaining the genus *Pentamerus* is founded on an alleged wide dissimilarity between its internal apparatus and that of all other cognate genera: it has been shown however that the amount of dissimilarity is not so great: nevertheless, very few will be disposed to question the validity of this genus, inasmuch as it possesses a combination of characters peculiar to itself. This is no more than may be claimed for *Camerophoria*, which, until it is known that a projecting process for the support of the valvular muscles exists in the lower valve of other Palliobranchs, may be considered a more isolated genus than *Pentamerus*.

Reverting to the remaining characters belonging to *Camerophoria*, the platform appears to be the same as the crural base (in this case a flat one) of *Terebratula*, and may therefore have supported the inferior pedicle muscles. The filiform processes I am disposed to look upon as supports for the labial appendages and the visceral parts of the mollusk.

It may be asked, is not the valvular muscular process in the ventral valve of *Camerophoria*, the plates of *Pentamerus* united? Considering the definition previously given of a socket-plate, I am certainly disposed to think that it is not: the latter being prolongations of the socket-walls, compels us to consider them as true socket-plates; but as regards the former, its total want of connexion with the sockets, and its striking off from below the centre of the free margin of the platform, strongly support the view that it is the mesial plate to be seen in the lower valve of many shells (*Atrypa concentrica*, *Terebratula rostrata*, *Hypothyris pugnus*, *Orthis Michelini*, *Strigiocephalus*, &c.) bilaterally expanded on its superior margin.

Camerophoria appears to have an extensive geographical range. M. Verneuil has collected two species in Russia, *C. Schlotheimi* and *C. superstes*, the former in the carboniferous limestone and the latter in the lowest beds of the Permian system. I have specimens of an allied species from the mountain limestone of Weardale. The genus abounds in the magnesian limestone near Sunderland, and in the Zechstein of the Thuringer-Wald: in the former locality three, if not more species are found. The strong external resemblance which *Camerophoria* bears to certain carboniferous and Devonian shells, leads me to think that it will hereafter be found to comprise a number of species*.

* As M. Verneuil's objection to the genus *Camerophoria* appears to be founded only on a knowledge of the structure of the dorsal valve, it will be unnecessary to say more than that, if the species belonging to it differed from

STROPHALOSIA.

If we examine *Productus giganteus*, *P. horridus*, &c., it will be seen that they do not possess articulating condyles nor an area. The absence of these characters has generally been urged as essentially distinguishing *Productus* from most of the Palæobranchiate genera. It is not to be denied, however, that some species of this genus may have existed possessing an area and teeth in a rudimentary or incipient state*. Considering how closely allied *Productus* is to the dentigerous and arcated genera, the presence of these characters under such a condition is to be expected in some species, which in this case would be looked upon as so many aberrant forms; but when we find both the condyles and area assuming a fully developed form, and prevailing in a number of species allied to each other by other distinguishing characters; and these species belonging to three consecutive geological periods, and having a wide geographical range, it then becomes a question whether it would not be working out a natural division to group such species under a separate genus: as this is my opinion, I have been induced to form a genus for them, bearing the name *Strophalosia*.

It will now be necessary to enter more into detail respecting the distinguishing characters of *Strophalosia*. Both valves possess an area, that of the ventral valve being merely the hinge-plate thickened: the area of the dorsal valve is furnished with a cicatrized deltidium, at the base of which are situated two condyles which fit into a pair of sockets excavated in the hinge-plate of the opposite valve, one on each side of the cardinal muscular fulcrum: the umbone of the large valve is generally flattened or irregularly indented, and the entire face of the ventral valve is often furnished with spines†.

Hypothyris only to the extent that *Orthis adscendens* and *Spirifer heteroclitus* do from their respective genera, I would not hesitate to consider them as *Hypothyris*es.

* M. Verneuil places *Productus comoides* in *Chonetes*, because it possesses an area and cardinal spines. If the figures given by Von Buch in plate 1 of his memoir on *Productus* represent the internal structure of *P. comoides*, we may then be certain that this species does not belong to *Chonetes*, since the concave or ventral valve of this genus is not furnished with the crescent-shaped bodies to be seen in one of the figures just referred to, and characteristic of *Productus*. A specimen of *Productus giganteus* in the Newcastle museum exhibits what might be taken for an area, but which, instead of being an additional piece set on the hinge-plate, as is the case with a true area, is only the hinge-plate itself considerably thickened. Perhaps this is the case with the *Productus comoides* examined by M. Verneuil.

† M. Verneuil has pointed out the existence of spines on the flat valve of the so-called *Productus horrescens*. In the true *Productuses*, the spines, when present on this valve, are generally confined to the cardinal region: *Productus punctatus* and *P. fimbriatus* may be exceptions.

The whole of the foregoing characters distinguish *Strophalosia* from *Productus*, both of which agree in the form of their valves, in their dorsal valve being beset with spines, and to a certain extent in their internal structure*.

Another apparent distinguishing character of *Strophalosia* consists in its habit or mode of attachment: the flattened state of the umbone, so general to the species, goes far to prove that they were attached to foreign bodies by this part, as obtains in most of the Thecideas; further, several of my specimens of a magnesian limestone species are found under circumstances completely proving, that in addition to an umbonal attachment, they adhered to the inner surface of dead shells of *Productus horridus* by means of long creeping spines†.

The species which I purpose placing in the genus *Strophalosia* are the following: *Productus horrescens*, Vern.; *P. subaculeatus*, Murch.; *Orthis productoides*, Murch.; a Himalayan fossil, three magnesian limestone species found in the neighbourhood of Sunderland, and a few doubtful forms, as *Productus spinulosus*.

The above shells are found in the Devonian, Carboniferous and Permian deposits. They have equally as extensive a geographical range. M. Verneuil has discovered two species in Russia: three species occur in the magnesian limestone of Sunderland, one of which I have found in the Zechstein of Könitz in Thuringia: one (or more) belongs to our home carboniferous deposits: species identical with those found in Russia, and some others, occur in the Eifel and the Bas-Boulonnais: and I have specimens of a species‡ collected by the late Dr. Gerard in crossing the boundary

* There is a slight but interesting difference between *Strophalosia* and *Productus* in their ovarian impressions or crescent shaped bodies, which will be explained and figured in my "Monograph."

† This mode of attachment of *Strophalosia* will probably throw some light on the habit of *Productus*. Many suppose that the latter was attached by means of fibres passing out between the hinge-plates, which does not appear to be supported by any evidence. Koninek, from an examination of *Productus proboscideus*, supposes that it was attached by means of fibres passing out of the anterior opening, which would compel us to conclude that the genus did not belong to the *Palliobranchiata*. Instead of *Productus proboscideus* subserving such an office, I cannot but think that it simply served as a passage for the ingress and egress currents. The tubular form of the anterior opening is also seen in old individuals of a magnesian limestone *Strophalosia*. As the convex valve of *Strophalosia* was attached, I am led to believe that the same valve of *Productus* was the inferior one, as is the case with *Pecten dentatus*, *P. Jacobaeus*, and others having the byssal sinus or notch in the large valve.

‡ This is the shell which Dr. Gerard alludes to in his Journal as resembling an oyster (vide Asiatic Researches of the Bengal Society, vol. xviii.). As it does not appear to have been named, I embrace the present opportunity of dedicating it to this enterprising traveller, and drawing up a provisional specific character for it.

Strophalosia Gerardi.—*External Characters*. Form oval; width greater

of Ladakh and Bis-ahar, in the Himalayas, at an elevation of 17,000 feet above the level of the sea.

Strophalosia and *Productus* are placed in the synoptical table in a family distinct from that of *Strophomenida*, because from all the genera of the latter they are distinguished by the form of their ovarian spaces and the presence of spines. In the former character some of the *Strophomenas* (*S. transversalis*, *S. oblonga*, &c.) appear to approximate them; and in the latter they are assimilated to a certain extent by *Chonetes*.

XII.—*Excursions in Upper Styria, 1842.*

By R. C. ALEXANDER, M.D.*

ON the 2nd of July I visited the romantic ravine between Arzberg and Gutenberg, and found *Pyrola media*, *Saxifraga elatior* (M. and K.), *Aizoon rotundifolia*, *Sedum dasyphyllum*, *Rhododendron hirsutum*, *Athamanta cretensis*, *Teucrium montanum*, *Scrophularia canina*, *Euonymus latifolius*, *Dianthus plumarius*, *Hieracium incisum*, *Mæhringia Pona*, *Peltaria alliacea*, *Arenaria luricifolia*.

On the 7th of July I was on the Schöckel, a mountain above 5000 English feet high, near Gratz, and found *Ranunculus alpestris* and *aconitifolius*, *Hieracium villosum*, *Botrychium lunaria*, *Saxifraga controversa*, *Soldanella alpina* in fruit, *Spergula saginoides*, *Anthemis tinctoria*, but was prevented by heavy rain from continuing on the mountain.

On the 15th of July I was on the Lantsch, and found *Astragalus Cicer*, *Mæhringia heterophylla*, Koch (*diversifol.* Doll.), *Melica ciliata*, *Sambucus racemosa*, *Myagrum paniculatum*, *Semprevivum hirtum*, *Androsace lactea*, *Aronicum Clusii*, *Carex atrata* and *firma*, *Chrysanthemum corymbosum*, *Cotoneaster vulgaris*, *Centaurea montana*, *Cortusa Matthioli*, *Carduus personata*, *Dryas octopetala*, *Geum rivale*, *Gymnadenia conopsea* var. *minor*, *Lonicera nigra*, *Orchis globosa*, *Ribes alpinum*, *Sonchus alpinus*, *Silene acau-*

than the length in the proportion of six to five. [The specimens examined are $1\frac{1}{4}$ in. wide and $1\frac{1}{4}$ in. long.] Upper valve convex, the convexity, which is greatest over the cardinal line, equal to one-third of the width of the shell: opposite valve concave, the concavity equal to half of the convexity of the upper valve. Umbone rounded, slightly prominent. Area: length equal to half the width of the shell, depth equal to one-sixth of its own length. Deltidium, the base one-third the length of its side. Spines of the dorsal valve adpressed, none exceeding a quarter of an inch in length, distant from each by a space equal to twice their diameter (which is the sixteenth of an inch in the largest spines): spines of the ventral valve (specimens imperfect in this particular).—*Internal Characters* (unknown). The formation to which this species belongs has not yet been ascertained: one of my specimens is associated with a *Fenestella*. It is from the crest of a pass near the boundary of Ladakh and Bisahar at an elevation of 17,000 feet.

* Read before the Botanical Society of Edinburgh, April 9th, 1846.

lis, *Thlaspi montanum*, *Thesium alpinum*, *Veratrum album*, *Pedicularis verticillata*, *Convallaria verticillata*, *Valeriana saxatilis*, *Draba aizoides*, *Gentiana acaulis*, *Lilium bulbiferum*, *Potentilla Clusiana*, *Helianthemum aelandicum*, *Primula integrifolia*, and all that I had found on the Schöckel.

At an inn at the foot of the mountain the people spoke a jargon that I had great difficulty in understanding, and they had as much I suppose in comprehending me. The innkeeper told me, begging my pardon, that I did not speak German very well, and should stay a month or two with him in the Breitenau to learn the language. I asked him if he did not think I had better opportunities in Gratz: Oh no, he said, they talk there according to book, "nach der Schrift."

The Lantsch is one of the stations given in books for the rare *Saxifraga hieracifolia* on the authority of Vest, the late Professor. It has never been found there, the specimen in Vest's herbarium having been sent to him from the Carpathians by Zahlbruckner, and recognised by him here in Gratz. Whether Vest wished to have the credit of finding a rare plant, or from slovenliness had got the Carpathian specimen mixed with Styrian ones accidentally, I cannot say. He was the most untidy botanist ever known. His specimens were never pressed, but put as they were into handboxes. Dr. Maly was commissioned after his death to examine the collection, and gives a most humorous account of it,—a blackberry stuck with a pin upon a leaf, &c. The *Saxifraga* in question has been found on the Reichart, but very sparingly.

My next excursion was over the alps to Leoben. On the way I found abundance of the *Mehringia heterophylla*, but already out of blossom. It was first discovered by M. Zehentner about three years ago, and appears to be very common in ravines where the stone is clay-slate, both in Styria and Carinthia. *Phyteuma scorzonrifolium* and some common subalpine plants.

From Leoben I made a very pleasant and remunerating excursion up the Reiting. It is tedious to give a mere catalogue of the plants collected on every separate mountain when there is nothing particularly interesting about any of them, and I shall therefore give a full list at the end. On this excursion, from incautiously drinking cold milk and cold water, I suffered for the rest of the summer from diarrhœa on all the alps that I attempted to ascend. I believe the milk is the chief cause of this complaint, and in Upper Styria there is nothing else to be got on the mountains. The next that I explored was the Grimming, a very difficult and dangerous one, consisting of a brittle limestone that splinters in the hand of the climber. During a hailstorm that overtook us great masses came rolling down the ravines. I found that day scarcely anything. On the Hoch Yolling, about 10,000

English feet high, I collected many interesting things: *Eritrichium Hacquetii*, *Androsace alpina*, *Geum reptans*, *Sesleria disticha*, *Primula glutinosa*, and others that grow at the snow line.

Having given a rather detailed account of excursions in the Windisch part of the province, it is fair here to describe one in Upper Styria. On the road towards the Grimming my fellow-traveller was a very intelligent mine-engineer from Hungary, who had been appointed to superintend some iron-works of a Styrian company and been in their service many years. By his recommendation I visited Schladming. The valley is for an alpine country extremely beautiful. To me alps have no great charms, but the outline of the mountains here is grand and striking. The path from Schladming leads for an English mile along a succession of fine waterfalls. The valley then divides, and I ascended the Unterthal. The protestant clergyman lent me a book descriptive of the district, in which these two dales, Oberthal and Unterthal, are raised into competition with the most beautiful parts of Tyrol. It was into these mountains that the protestants fled for refuge during the persecution under Ferdinand II., and half the population of Schladming and the whole of that of the Ramsau is of that persuasion. They are now tolerated. Nothing can be more striking than the difference between this protestant part and the rest of Styria. Here I found beautiful cattle, well-built houses two or three stories high, good fences and well-dressed people. I felt on entering the Ramsau as if I were come to a different kingdom. I had often heard the remark made of the Swiss cantons, but could not conceive it fully till I made this excursion.

The Yolling lies on the opposite side of Schladming. The guide told me I should find good night-quarters, and brought me to the hut where the dairymaid lives during the summer months, the Zennerinn.

The next morning we started at five, and were within an hour's walk of the summit, when the clouds approaching rendered it dangerous to proceed, and we descended by a different path into the Oberthal.

For the first time I had the opportunity of seeing pastoral life on an alp. The evening in July draws in there at about six o'clock, and the goats come home of their own accord. The cows and sheep must be driven home. It is extraordinary how these latter climb the precipices, the cows as well as the sheep. In Switzerland in the same situation there would probably have been a decent inn and accommodation for travellers as good as in towns. In Styria one must content oneself with admiring nature. One advantage of travelling here is the cheapness. I gave a shepherd boy who accompanied me about three hours a

ten-kreuzer piece, fourpence English, and he kissed my hand and said it was too much.

As a sample of what may be found on one of the higher mountains in this province, I give the catalogue of what I brought home from the Yolling:—

<i>Aronicum Clusii</i> and <i>var. glaciale.</i>	<i>Linaria alpina.</i>
<i>Azalea procumbens.</i>	<i>Oxyria reniformis.</i>
<i>Aconitum Lycoctonum.</i>	<i>Polygonum viviparum.</i>
<i>Napellus.</i>	<i>Pedicularis incarnata.</i>
<i>Avena sempervirens.</i>	<i>asplenifolia.</i>
<i>versicolor.</i>	<i>recutita.</i>
<i>Androsace alpina.</i>	<i>Phyteuma hemisphaericum.</i>
<i>Arenaria austriaca.</i>	<i>globularifolium.</i>
<i>Agrostis rupestris.</i>	<i>Phleum alpinum.</i>
<i>Aspidium Lonchitis.</i>	<i>Potentilla aurea.</i>
<i>Bartsia alpina.</i>	<i>clusiana.</i>
<i>Carex frigida.</i>	<i>Primula minima.</i>
<i>atrata.</i>	<i>glutinosa.</i>
<i>curvula.</i>	<i>Pinguicula alpina.</i>
<i>Centaurea Phrygia.</i>	<i>Ranunculus glacialis.</i>
<i>Cirsium heterophyllum.</i>	<i>Rhododendron ferrugineum.</i>
<i>spinosissimum.</i>	<i>Rhodiola rosea.</i>
<i>Chrysanthemum alpinum.</i>	<i>Salix retusa.</i>
<i>Cerastium ovatum, Hopf.</i>	<i>Statice alpina.</i>
<i>Cardamine resedifolia.</i>	<i>Saxifraga muscoides.</i>
<i>alpina.</i>	<i>androsacca.</i>
<i>Campanula alpina.</i>	<i>stellaris.</i>
<i>pusilla.</i>	<i>aspera.</i>
<i>barbata.</i>	<i>Aizoon.</i>
<i>Cherleria scoldoides.</i>	<i>aizoides.</i>
<i>Cineraria rivularis.</i>	<i>oppositifolia.</i>
<i>Eritrichium Haquetii.</i>	<i>rotundifolia.</i>
<i>Eriophorum capitatum.</i>	<i>Sempervivum montanum.</i>
<i>Euphrasia salisburgensis.</i>	<i>arachnoideum.</i>
<i>Geum montanum.</i>	<i>Silene acaulis.</i>
<i>reptans.</i>	<i>Pumilio.</i>
<i>Gentiana punctata.</i>	<i>Sesleria disticha.</i>
<i>nivalis.</i>	<i>Soldanella pusilla.</i>
<i>acaulis.</i>	<i>Swertia perennis.</i>
<i>bavarica</i> β . <i>imbricata, Schlecht.</i>	<i>Senecio alpinus.</i>
<i>Gnaphalium fuscum.</i>	<i>carniolicus.</i>
<i>Hedysarum obscurum.</i>	<i>Vaccinium uliginosum.</i>
<i>Hutchinsia alpina.</i>	<i>Valeriana celtica.</i>
<i>Heracleum austriacum.</i>	<i>Veronica alpina.</i>

My next excursion was to Klagenfurt, and thence up the Sultzbach mountain on the frontier of Styria and Carniola. Klagenfurt is situated on the Drave exactly as Gratz is on the Mur, in the midst of a tract of alluvial land, and has nearly the same flora. Arrived at Sultzbach, we quartered ourselves on the clergyman, who does not exactly keep an inn, but is very happy to see respectable travellers, and does not refuse a few florins as recompense. He is the only person in the place ex-

cept his housekeeper that understands German. The friend who accompanied me was too zealous a catholic to climb a mountain on Frauen Tag, and so I went up alone and found the beautiful *Campanula Zoysii*, *Saxifraga squarrosa*, Sieb., and *Cirsium carniolicum*, Scop. The latter was a new discovery for the flora of Styria. The rain compelled me to return long before reaching the top. *Astrantia carniolica* and *Hieracium porrifolium* are very abundant there. Next day was a grand dinner at the clergyman's, and two vicars from neighbouring mountain parishes came to assist at some solemnity and dined with us. Among other dainties was bear's meat. One of the two visitors was a young man much taken with botany. He told me I should do him a great favour if I could induce any friend to come and stay with him a whole summer. He has nobody but his clerk to speak to, knows all the mountains well, and would gladly accompany his visitor on all his rambles. I asked him if he would plague himself with a foreigner who could not speak much German. He said he would welcome anybody who came as a botanist. Sieber was several summers on that part of the range called the Loibl, and to judge from the herbaria of friends who have explored it, there are no mountains in Austria that would better repay the trouble of searching them.

Returning from Sultzbach by the magnificent Schwarzenbach valley, I found *Campanula thyrsoides* tolerably abundant.

Since my return to Gratz I have made one short trip to Feistritz, more as an afternoon's drive than an excursion, but found *Helianthemum fumana* and *Mentha gentilis*; and since then, in company with Dr. Maly, *Falcaria Rivini*, *Galium boreale* and *pariense*.

The principal Plants collected in Styria, south of the Drave, in 1842, with a few from the neighbouring provinces.

<i>Clematis erecta</i> , L.	<i>Actaea spicata</i> , L.
<i>Vitalba</i> , L.	—
<i>Atragene alpina</i> , L.	<i>Berberis vulgaris</i> , L.
<i>Thalictrum aquilegifolium</i> , L.	<i>Epimedium alpinum</i> , L.
<i>minus</i> , L.	<i>Nymphaea alba</i> , L.
<i>Anemone trifolia</i> , L.	<i>Nuphar lutea</i> , Sm.
<i>ranunculoides</i> , L.	<i>Corydalis cava</i> , Schw.
<i>Adonis aestivalis</i> , L.	<i>solida</i> , Sm.
<i>Ranunculus Thora</i> , L.	—
<i>auricomus</i> , L.	<i>Nasturtium officinale</i> , R. Br.
<i>sceleratus</i> , L.	<i>palustre</i> , DC.
<i>Helleborus niger</i> , L.	<i>sylvestre</i> , R. B.
<i>viridis</i> , L.	<i>Barbarea vulgaris</i> , R. B.
<i>atrorubens</i> , W. K.	<i>Turritis glabra</i> , L.
<i>Isopyrum thalictroides</i> , L.	<i>Arabis turrita</i> , L.
<i>Delphinium Consolida</i> , L.	<i>alpina</i> , L.
<i>Aconitum Lycoctonum</i> , L.	<i>arenosa</i> , Scop.

- Cardamine amara*, *L.*
 impatiens, *L.*
 trifolia, *L.*
Dentaria trifolia, *W. K.*
 enneaphyllos, *L.*
 pinnata, *Lam.*
 bulbifera, *L.*
Hesperis matronalis, *L.*
Sisymbrium Sophia, *L.*
Erysimum pallens, *Hall.*
 strictum, *Wett.*
Alyssum montanum, *L.?*
 calycinum, *L.*
Farsetia incana, *R. B.*
Lunaria rediviva, *L.*
Draba aizoides, *L.*
Kernera saxatilis, *Reich.*
Camelina sativa, *Cran.*
Thlaspi perfoliatum, *L.*
 montanum, *L.*
Biscutella laevigata, *L.*
Lepidium Draba, *L.*
Neslia paniculata, *Desc.*

Helianthemum alandicum, *W.*
 num.
Viola lactea, *R. B.*
 mirabilis, *Jacq.*
 biflora, *L.*
Parnassia palustris, *L.*
Polygala comosa, *Schk.*
 amara, *L.*
Tunica Saxifraga, *Scop.*
Dianthus Armeria, *L.*
 sylvestris, *Wulf.*
 plumarius, *L.*
 carthusianorum, *L.*
 barbatus, *L.*
 deltoides, *L.*
Saponaria officinalis, *L.*
Silene nemoralis, *W. K.*
 nutans, *L.*
 gallica, *L.*
 rubella, *Wulf.*
 Saxifraga, *L.*
 quadritida, *L.*
 alpestris, *Jacq.*
 rupestris, *L.*
Lychuis Viscaria, *L.*
Arenaria rubra, *L.*
Mœhringia muscosa, *L.*
 Ponæ, *Fenzl.*
Stellaria nemorum, *L.*
Mœnchia mantica, *K.*
Linum viscosum, *L.*
 flavum, *L.*
Malva Alcea, *L.*
- Althæa officinalis*, *L.*
Hypericum humifusum, *L.*
Acer pseudo-platanus, *L.*
Geranium phæum, *L.*
 sylvaticum, *L.*
Impatiens Noli-me-tangere, *L.*
Staphylea pinnata, *L.*
Euonymus latifolius, *L.*
 verrucosus, *Jacq.*
Rhamnus alpinus, *L.*
Rhus Cotinus, *L.*
Genista scariosa, *Viv.*
 germanica, *L.*
 sagittalis, *L.*
 tinctoria, *L.*, *pubescens*, *Lang.*
Cytisus alpinus, *L.*
 purpureus, *L.*
 prostratus, *Scop.*
 hirsutus, *L.*
 capitatus, *Jacq.*
 nigricans, *L.*
Ononis hircina, *Jacq.*
Medicago carstiensis, *Jacq.*
Melilotus vulgaris, *Willd.*
Trifolium medium, *L.*
 alpestre, *L.*
 rubens, *L.*
 ochroleucum, *L.*
 avense, *L.*
 montanum, *L.*
 hybridum, *L.*
 patens, *Schreb.*
Dorycnium herbaceum, *Vill.*
Galega officinalis, *L.*
Coronilla coronata, *Jacq.*
 varia, *L.*
Hippocrepis comosa, *L.*
Vicia grandiflora, *Scop.*
 tenuifolia, *Roth.*
 oroboides, *Wulf.*
 lathyroides, *L.*
Lathyrus Aphaca, *L.*
 Nissolia, *L.*
 tuberosus, *L.*
Orobis vernus, *L.*
 niger, *L.*
 luteus, *L.*
 tuberosus, *L.*

Prunus Padus, *L.*
Spiræa Aruncus, *L.*
 ulmifolia, *L.*
 filipendula, *L.*
Fragaria elatior, *Ehr.*
Potentilla rupestris, *L.*
 alba, *L.*
 recta, *L.*

- Potentilla inclinata*, *Vill.*
micrantha, *Ram.*
argentea, *L.*
aurea, *L.*
opaca, *L.*
caulescens, *L.*
Aremonia agrimonioides, *Neck.*
Rosa gallica, *L.*
alpina, *L.*
Alchemilla alpina, *L.*
Cratægus monogyna, *Jacq.*
Pyrus Chamæmespilus, *Lind.*
Aronia rotundifolia, *Pers.*
Sorbus Aria, *Cra.*
torminalis, *Cra.*
Aucuparia, *L.*

Circæa alpina, *L.*
Trapa natans, *L.*
Hippuris vulgaris, *L.*
Peplis Portula, *L.*
Montia fontana, *L.*
Herniaria glabra, *L.*
Sedum hispanicum, *L.*
album, *L.*
sexangulare, *L.*
dasyphyllum, *L.*
Saxifraga Aizoon, *L.*
cristata, *Vest.*
squarrosa, *Sieb.*
aizoides, *L.*
atrorubens, *Bert.*
cuneifolia, *L.*
bulbifera, *L.*
rotundifolia, *L.*
Chrysosplenium alternifolium.

Dondia Epipactis, *Spr.*
Astrantia major, *L.*
carniolica, *Scop.*
Eryngium campestre, *L.*
Carum Carui, *L.*
Seseli glaucum, *L.*
Athamanta cretensis, *L.*
Peucedanum Oroselinum, *Mæn.*
Heracleum austriacum, *L.*
Laserpitium latifolium, *L.*
Siler, *L.*
Scandix Pecten-Veneris, *L.*
Chærophyllyum hirsutum, *L.*

Loranthus europæus, *L.*
Sambucus racemosus, *L.*
Lonicera Xylosteum, *L.*
Caprifolium, *L.*
alpigena, *L.*
Asperula arvensis, *L.*
- Galium verum*, *Scop.*
rotundifolium, *L.*
sylvaticum, *L.*
Valeriana tripteris, *L.*
saxatilis, *L.*
Dipsacus laciniatus, *L.*
Scabiosa sylvatica, *L.*
ochroleuca, *L.*

Cacalia alpina, *L.*
Homogyne sylvestris, *Cass.*
alpina, *Cass.*
Petasites albus, *Gürt.*
Bellidistrum Michellii, *Cass.*
Erigeron canadensis, *L.*
Buphthalmum salicifolium, *L.*
Inula hirta, *L.*
Pulicaria dysenteria, *L.*
Chrysanthemum corymbosum, *L.*
Pyrethrum macrophyllum, *Willd.*
Doronicum austriacum, *Jacq.*
Arnica montana, *L.*
Cineraria crispa, *L.*
longifolia, *Jacq.*
Senecio nemorensis, *L.*
Fuchsii, *Gmel.*
Cirsium pannonicum, *Gaud.*
carniolicum, *Scop.*
Erisithales, *L.*
Carduus personata, *L.*
nutans, *L.*
Carlina acaulis, *L.*
Centaurea Jacea, *L.*
nigrescens, *Willd.*
variegata, *Lam.*
Lapsana foetida, *Willd.*
Leontodon incanus, *Schrank.*
Hypochaeris maculata, *L.*
Taraxacum lividum, *Wig.*
Prenanthes purpurea, *L.*
Lactuca perennis, *L.*
Crepis præmorsa, *Tausch.*
Hieracium Auricula, *L.*
porrifolium, *L.*
flexuosum, *W. Kit.*
Xanthium strumarium, *L.*
Phyteuma nigrum, *Schn.*
spicatum, *L.*
Campanula Zoysii.
pusilla, *Hænke.*
patula, *L.*
sibirica, *L.*
persicifolia, *L.*
rapunculoides, *L.*
thyrsoides, *L.*
Cervicaria, *L.*
barbata, *L.*

- Prismatocarpus Speculum, L'Her.*
Vaccinium Vitis Idæa, L.
Erica carnea, L.
Rhododendron hirsutus, L.
 Chamæcistus, L.
Pyrola chlorantha, Swar.
 uniflora, L.
 secunda, L.
Monotropa Hypopitys.
Fraxinus Ornus, L.
Cynanchum vincetoxicum, R. Br.
Vinca minor, L.
Menyanthes trifoliata, L.
Gentiana cruciata, L.
 asclepiadea, L.
 utriculosa, L.
 germanica, L.
Cuscuta europæa, L.
 Epithymum, L.
 Epilinum, Weihe.
Echinospermum Lappula, L.
Omphalodes verna, Mæn.
Symphytum tuberosum, L.
Cerinth minor, L.
Pulmonaria mollis, Wolf.
 officinalis, L.
Lithospermum purp. cærul., L.
Myosotis sparsiflora, Mæn.
Physalis Alkekengi, L.
Scopolina atropoides, Schull.
Verbascum Blattaria, L.
 orientale, M. B.
 phlomoides, L.
Scrophularia glandulosa, W. K.
 canina, L.
 vernalis, L.
Gratiola officinalis, L.
Digitalis grandiflora, Lam.
Antirrhinum majus, L.
 Orontium, L.
Orobanche Picridis, Schul.
Veronica austriaca, Jacq.
 acinifolia, L.
 triphyllus, L.
 saxatilis, L.
 urticifolia, L.
 latifolia, L.
Pæderota Ageria, L.
Rhinanthus Alectorolophus, L.
Bartsia alpina, L.
Euphrasia salisburgensis, Funk.
Salvia glutinosa, L.
 pratensis, L.
 verticillata, L.
Calamintha grandiflora, Mæn.
Glechoma hirsuta, W. K.
Lamium Orvula, L.
 incisum, Willd.
 maculatum, L.
Galeobdolon luteum, Huds.
Stachys alpina, L.
 recta, L.
Leonurus Cardiaea, L.
Scutellaria hastifolia, L.
Prunella grandiflora, L.
 alba, Pall.
Ajuga genevensis, L.
 Chamæpitys, L.
Teucrium Botrys, L.
 Chamædrys, L.
Utricularia vulgaris, L.
Lysimachia punctata, L.
Primula Auricula, L.
Cyclamen europæum, L.
Globularia vulgaris, L.
 cordifolia, L.
Calamintha Nepeta, L.

Amaranthus Blitum, Sm.
 retroflexus, L.
Kochia scoparia, Schr.
Daphne Cneorum, L.
 Mezercon, L.
Thesium alpinum, L.
 intermedium, Schrad.
Aristolochia pallida, W. K.
 Clematitis, L.
Asarum europæum, L.
Euphorbia dulcis, L.
 verrucosa, L.
 epithymoides, L.
 Esula, L.
 virgata, W. Kit.
Mercurialis ovata, Hoppe.
Parietaria erecta, M. K.
Quercus pubescens, Will.
 Cerris, L.
Ostrya vulgaris, Will.
Juniperus nana, Will.

Acorus Calamus, L.
Arum maculatum, L.
Orchis fusca, Jacq.
 militaris, L.
 variegata, All.
 globosa, L.
 sambucina, L.
 pallens, L.
 speciosa, Host.
 albida, Scop.
 hircina, Swartz.
 coriophora, L.
 ustulata, L.
Opheys myodes, Sw.

- Ophrys arachnites*, *Hfm.*
aranifera, *Huds.*
Epipogium Gmelini, *Rich.*
Cephalanthera pallens, *Rich.*
rubra, *Rich.*
Epipactis latifolia, *Sw.*
Listera Nidus-avis, *Hook.*
Corallorhiza innata, *R. Br.*
Crocus vernus, *L.*
Iris germanica, *L.*
graminea, *L.*
Leucojum aestivum, *L.*
Galanthus nivalis, *L.*
Convallaria verticillata, *L.*
polygonatum, *L.*
Maianthemum bifolium, *DC.*
Ruscus hypoglossum, *L.*
Tamus communis, *L.*
Lilium Martagon, *L.*
chalconicum, *DC.*
Erythronium Dens-canis, *L.*
Anthericum ramosum, *L.*
Hemerocallis flava, *L.*
Ornithogalum pyrenaicum, *L.*
umbellatum, *L.*
luteum, *L.*
Scilla bifolia, *Ait.*
Allium ursinum, *L.*
carinatum, *Sm.*
Muscari comosum, *Mill.*
Muscari racemosum, *Mill.*
Veratrum album, *L.*
Tofieldia calyculata, *Wahl.*
Luzula albidula, *DC.*
Carex Davalliana, *Sm.*
brizoides, *L.*
montana, *L.*
alba, *Scop.*
pilosa, *Scop.*
humilis, *Legs.*
pendula, *Good.*
vesicaria, *L.*
hirta, *L.*, *sublaevis.*
Michellii, *Host.*
Panicum Crus-Galli, *L.*
miliaceum.
Hierochloa australis, *R. S.*
Phleum Michellii, *All.*
Milium effusum, *L.*
Sesleria caerulea, *Ard.*
Melica nutans, *L.*
ciliata, *L.*
Poa bulbosa, *L.*, *vivipara.*
Cynosurus echinatus, *L.*
Festuca sylvatica, *Vill.*
Brachypodium sylvaticum, *Bea.*
Bromus secalinus, *L.*
Lolium speciosum, *Str.*
temulentum, *L.*
Struthiopteris germanica, *L.*

XIII.—*The Birds of Calcutta, collected and described by*

CARL J. SUNDEVALL.

[THE following memoir is contained in a small but valuable collection of scientific papers published at Lund in Sweden, under the title of 'Physiographiska Sällskapet's Tidskrift.' One volume only has appeared, in 8vo, dated 1837–38, and, like the greater part of the scientific literature of Scandinavia, is almost wholly unknown in this country. As Prof. Sundevall's memoir on the Birds of Calcutta was likely to interest Anglo-Indian naturalists, I have long wished to get it translated; but as there is no Swedish and English Dictionary or Grammar to be procured in London, I was unable either to make the translation myself or to obtain one from others. By the kindness however of M. Bertram, a distinguished German and Scandinavian scholar residing in Oxford, I am now enabled to present a translation of this interesting memoir.—H. E. STRICKLAND.]

The scarcity of exact accounts of the ornithology of India may give some interest to the following notice of those birds which I myself saw and collected in the neighbourhood of Calcutta in the

year 1828; although these amount to very few, considering the great number of birds which must be found in such a rich country as Bengal situated under the tropics*.

I staid in that country from the beginning of February till nearly the middle of May, rather more than three months; but I must not forget to observe, that during that time my attention was much taken up by the increasing new objects of all kinds, with the view of obtaining as many as possible of every description of natural productions. The specimens which I brought home are preserved in the collection of the first gentleman of the bed-chamber, Baron Gyllenkroks, through whose patronage I had the opportunity of visiting India. I have only examined the nearest spots around Calcutta and the Danish possession Serampore, which is situated on the river four geographical miles to the north; also the banks of the river a few miles further to the north as far as Suesagor, where a small lake is found which abounds in water-birds. The whole of this spot is cultivated and taken possession of by man, just as much as any part in Europe. The country is low and flat and covered with mud, free from stones, for it is the deposit of the floods, and consequently increases every year. It is used by turns for farming or plantation as well as for groves of a great variety of trees, but mostly for bamboos and fruit-trees. These groves are for several miles around Calcutta so numerous that the country looks like a large forest, but five or six [Swedish] miles to the north above Chandernagor and Hoogly, or near Suesagor, the great plains of Bengal commence. There is never an opportunity to visit the remarkable uninhabited tract of the coast close to the sea called Sunderbunds, which occupies eight to twelve miles to the south of Calcutta, which latter is situated fifteen miles from the sea. The tract is very woody, marshy, and in the highest degree unhealthy. The tigers which it is said are found there, but still more the *quickly-killing fever* (jungle-fever), which generally attacks those who dare to visit these wild tracts, have made the name alone a horror to the inhabitants of Calcutta. Certain I was that the tales were ex-

* Besides the circulated accounts, the original sources for the ornithology of India known to me are principally Gould's 'Birds of the Himalaya Mountains,' whose work I have not had an opportunity to make use of, and also Gray's 'Illustrations of Indian Zoology,' of which seven parts contain forty-five birds. The earlier accounts, *e. g.* Sonnerat's, had been introduced already into the work of Latham. Latham's 'General History of Birds' contains an extraordinary number of Indian species, which for the greater part have been described after the drawings of General Hardwicke, Mr. Anstruther and others; but from the want of criticism, it is very difficult to make any use of this great work, which is the more to be regretted, as it contains numerous and excellent observations on the history of the different kinds by Buchanan and others.—C. J. S.

aggrated, and I wished to have gone thither, but I did not succeed. It is necessary to have been in Bengal in order to comprehend the difficulties which meet every deviation from the accustomed road as well as from general customs in every other respect. I have been able to obtain but little information as to what birds are stationary or propagate in that country, and what species are migratory. I only succeeded in discovering the propagation of a few species, and it appeared to me as if most of them intended to lay their eggs somewhat later in May, June, or about the same time as most of our birds. The answer to these questions is one of the most difficult tasks for a travelling ornithologist, but it is of some importance both for a future geography of birds as well as for a part of natural history in general.

From the following descriptions it appears that several remarkable singing-birds are quite common in India. They are found there as in all other countries; and I maintain the common idea with us to be wrong, that the tropical countries, which shine with a luxuriance and brightness both in plants and animals quite unknown in our country, are deficient in the charms and liveliness which the choir of singing-birds gives to our poorer climate.

On the contrary, I did not expect to find the singing of the birds less or worse about Calcutta than in Sweden, but there are some other reasons which the following facts will explain more clearly:—There are a great number of ill-looking, fearfully-screaming birds, of which our Crows and others can only be considered as insignificant representatives, besides a sufficient number of others, to raise in the eyes of most persons a pleasing impression of life in our forests. In India, as well as in most warm countries, they are on the other hand more numerous and scream much worse: they scream or chatter with too great a constancy. One class utter their frightful tones uninterruptedly in the middle of the day, when the heat invites both feathered and unfeathered lovers of music to rest. The latter are heard more than the singing-birds, and being more annoying they are more easily remembered, which is the reason that several travellers have complained of the singing of birds under the torrid zone. It was plainly to be observed that the number both of kinds and individuals was greater than with us, particularly in February and March, before the birds of passage had gone towards the north. Many of the common kinds shine with the most beautiful colours, so that by this alone any one might know that he was in a tropical country, but no one must conclude from this that all natural products are equally grand. On the contrary, the greatest part of them resemble the common productions in

our regions, and there are besides a great number which are uglier, or at least less beautiful, than some which are found in our country. These are less known, because they have been seldom mentioned in accounts of travels, but such are often the very things which offer the greatest interest to the natural philosopher.

Among the different kinds of Bengal birds which have been here enumerated are, besides some which cannot be ascertained with certainty, twenty-five which are European, and seventeen of them Swedish. Only six appear which I have not found described before, and therefore must be considered as new to science. Four kinds which are domesticated with us have been quoted, *i. e.* pigeon, fowl, goose and duck. The different kinds have been classified according to the system of ornithology which I have introduced in the 'Vetenskaps Academiens Handlingar' for 1835. The descriptions are in Latin, as they would be considerably diffuse in any other language. The citations of Latham are conformable to his 'Index Ornithologicus.'

I. VOLTURES.

1. *Oriolus melanocephalus*, L. Capite colloque nigris, tectricibus alarum extus flavis; rectricibus utrinque 4 (s. 3), fere totis flavis. Remiges 3—5 subæquales, reliquis longiores.

♂ *Adultus* (19 Febr. testiculis tumidis) flavissimus et nigerrimus. Alarum tectrices omnes totæ flavæ. Rectr. 4 mediæ basi latissime, apice angustius flavæ. Iris coccinea; rostrum late rubrum, pedes nigri.—9½ poll. Ala 138 millim., tarsus 24, cauda 96.

♂ *Junior* (d. 22 Febr. testic. minutis) saturate flavus, sordide tinctus. Caput et collum fusco-nigra, fronte cum orbitis flavescens; loris sordide albidis. Jugulum et gula cinereo-olivacea, maculis longitudinalibus nigris. Ala nigra remigibus 3 ultimis et tectricibus late flavo limbatis. Remiges primariæ margine tenui griseo; cubitales extus olivaceæ, margine flavo. Rectrices 3 extimæ sordide flavæ extus vitta marginali nigricante; 4a plaga laterali nigra ante apicem; 5a nigra, basi ad medium apiceque anguste flavis; 6a (seu media) olivacea. (In latere dextro 3a et 4a fascia latissima nigricante.) Rostrum nigro-fuscum; pedes nigri; iris obscure rubra. Ala 132 mill. (Edw. tab. 186, fig. bona, sed rostro falso.)

This beautiful bird is called by the Bengalese *Halda gull gull*, probably because these syllables are apparently heard in its common song. The older males sit generally quiet on the top of a bushy tree, where they are well-hidden beneath the leaves, but they betray themselves even in February by their beautiful and clear flute-like notes, which compared with those of other birds are purely musical, so that they can be perfectly imitated on a wind instrument, which is not the case with the singing of most other birds.

They frequently vary, but the general tone sounds something like *tshittily tshottily*, which is often repeated after a short stop. Now and then an ori-oli ! tio ! tjoti ! &c. is heard. I have tried to express these sounds by notes. This singing is interesting



from the clearness of its tone, but however richer in change, it does not seem to me to be near so agreeable as the monotonous but full and melodious sound of our cuckoo. The laughing sounds which Levaillant says he has heard from the same species in the south of Africa are unknown to me*. The hen-bird sings probably seldom, and on that account she is rarely to be met with, however common they were. The above-described young male did not sit quiet like the older ones, but hopped about among the branches without uttering a sound. In his stomach he had only a kind of round seed (probably of some parasite plant); but two older males which I dissected in February had only eaten blossoms of the mango-tree (*Mangifera indica*, L.). I have not noted down whether this bird was heard or seen after the end of March.

2. *Turdus cafer*, L.—Merle huppé du Cap de Bon Espérance, Briss., Buff. Pl. Enl. 563 (fig. non bona). Le Curouge, Levaill. Ois. Afr. 107. f. 1. (Gen. Pycnonotus, Kuhl=Ixos, Temm.)

Fuscus, capite subcristato, cum collo pectoreque nigris; crisso rubro; rectricibus apice uropygioque albis. Venter fusco-cinereus; remiges 4 gradatæ; iris fusco-rufescens. Magnit. alaudæ; ala 98 millim., cauda 97, tarsus 25. (Alius paulo minor.)

♂ (Calcutta, Febr. testic. tumidis) colores puri; tectrices caudæ nivæ; apice rosæ. ♀ (Calc. Febr.) paullo sordidius colorata, tectrices superiores caudæ cinerascens. Non minor quam mas. In utroque sexu plumæ dorsi, ventris anterioris et tectrices alæ cinerascens limbatæ.

This is the bird which the Hindoos called Bulbul, and which is considered the most distinguished singing-bird in India. It acts the same part in the Hindostan and Persian poetry as the Nightingale in the European, and the name Bulbul is translated by the Europeans in India 'Nightingale.' The singing of the Bulbul is pretty powerful, and contains some parts which are like those of our blackbird, but they are in general more lively, almost like the *Sylviidae*. It generally sings before noon, and even after the setting of the sun from the tops of the trees, with often

* It is now clearly ascertained that the S. African black-headed oriole (*O. larvatus*, Licht.) is quite distinct from *O. melanocephalus* of India, which at once accounts for the difference of their notes.—H. E. S.

interrupted strophes, like our thrush, so that a continuation of singing is seldom heard. It is said that it sings remarkably well even in a cage about evening; also that when in a free state it continues to sing through the whole month of June. Its common note is a warbling like that of the Thrushes, and sounds are sometimes heard resembling those of the human voice, and it is possible that its name is derived from this circumstance, for Bolla signifies in the Bengal language 'to speak,' 'to tell.' The singing was heard already in February. The *Turdus cafer* is stationary and numerous about Calcutta. No information about their propagation could be obtained. Their food is mixed: the above-described male had its stomach full of blossoms of the mango (*Mangifera*); the hen-bird had, on the contrary, only eaten insects. They were seen singly or by pairs in the trees, their movements did not seem to be very quick, and their flight was hopping, like our Warblers. The feathers of its head rose often to a tuft, both by the wind and by the bird itself.

This bird is found throughout India, and according to Levaillant, Brisson and others, in South Africa, most probably even in Persia and the middle of Africa. According to Pallas, it is the *Sylvia luscinia*, which the Armenians call Boulboul, and the Crim Tartars Bylbyl; but in the Persian language it is called Gandalip. I do not know which kind is meant by the Boelbel of the Arabians.

3. *Turdus jocosus*.—*Merula sinensis cristatus minor*, Briss. Orn. vol. ii. p. 255. tab. 21. f. 2; Buff. Pl. Enl. 508 (fig. mala). *Lanius jocosus*, Linn. *Lanius emeria*, Linn. sec. Albin et Edw. 190.

Cristatus griseo-fuscus, subtus cum gula albus, genis albis, linea tenui nigra cinctis, plumisque quibusdam longissimis, coccineis; crisso rubro. Fascia pectoris interrupta nigra. Iris fere nigro-fusca. Priori paullo minor.

♂ (Calcutta, Feb. 9, testic. tumidis). Ala 88 millim., tarsus 22½, cauda 82. Crissum fulvo-rubicundum, rectrices pleraque apice late nivei. ♀ (Calcutta, Mar. 12) similis, colore paullo sordido sed crisso fere coccineo. Rectrices apice sordide albidæ. Ala 82 mill., tarsus 22, cauda 70. Crista vix minor quam maris.

In the Bengal language this bird is called Sonna. It is considered to be stationary, and was not scarce. Its movements are not easy, but of a proud bearing, and it seemed to be very remarkable for its great strength. This bird has likewise the most perfect and firm muscular frame I have ever seen among singing-birds. The same is the case in a less degree with those before described, and most probably with all kinds of the very natural subgenus *Pycnonotus* (*Ixos*, Temm.) to which they belong. A part of this group has even been classified among the genus *Lanius*, which in the above respect resembles them; but it is

undeniable that they in form and the way of living come nearer to the *Turdi*, and I cannot do otherwise than consider them typically among the singing-birds of the Thrush kind. The *Turdus jocosus* is often seen boldly stepping from one branch to another, raising its tuft, spreading and again lowering its long red-coloured chin-feathers, which extend rather under the eyes. It sang pretty well, but I only heard a very unmusical *tshoppi tshoki*, almost resembling language, which when heard from five or six individuals that were once seen together in the same tree in the month of February, sounded almost as if several talkative human beings had been in a lively conversation at some distance. In the month of March and April I saw them only singly. The one described had in his stomach skins of insects; the hen-bird, on the contrary, only berries of the banyan-tree (*Ficus benjamina*).

4. *Turdus mindanensis*, Gm.—Dialbird, *Alb.*, *Edw.* 181. *Gracula saularis*, *Linn.* Merle de Mindanao, *Buff. Pl. Enl.* 627. f. 1. Le Cadran, *Levaill. Ois. Afr.* pl. 104. *Turdus amrenus*, *Horsf.* *Lanius musicus*, *Raff.* *Lanius saularis*, *Vieill.**

Nigricans ventre vittaque alarum albis. Rectricibus utrinque 3 totis albis, gradatis. Rostro recto. Ala ut in *Pycnonoto*, sed differt tarsis longioribus, rostro, cauda.

♂ (Calc. 18 Febr.) supra cæruleo-niger. Jugulum et pectus anticum pure nigra. Longit. 8 poll. Ala 93 mill., tarsus 30, cauda 86. (Indiv. e Java, ala 100, tarsus 30.)—♀ (Serampore 4 Mart.) obscure cinerea, collo antice dilutior. Color albus ut maris. Ala 90 mill., tarsus 29, cauda 80.

The Bengal name is *Dājāl*, which in the English orthography is written *Dial*, and has already been mentioned by Albin and Edwards. As far as I could learn, this name is originally Indian, without having anything in common with the English word *dial*. The actions of the bird in the trees are remarkably quick and lively. It is often seen flying from the dense summits of the trees, and plunging again into the foliage at a short distance. These actions have a very pleasing effect, as the black and white colours, which are arranged as in our Magpie, produce a beautiful contrast with the verdure. It was evident that a love of fighting and the instincts of spring produced this activity, which has given the bird a reputation for pugnacity and restlessness. On the ground it hops heavily but quickly, much like our Red-breast or Blackbird. Its song is beautiful and lively, and resembles most that of our *Sylvia hortensis*, but is stronger, and is often heard in the forenoon from the tops of the trees. In the

* M. Sundevall here unites the synonyms of the Malay species in which only three external pairs of rectrices are white, with the Indian bird in which the four outer pairs are white. The latter bird is the true *Copsychus saularis*.—H. E. S.

stomach of two individuals which I examined I found berries and insects. The bird is believed to be stationary in that country. It also exists in the Philippine Islands, Java, Sumatra, and in Africa as far as the Cape.

5. *Turdus citrinus*, Lath., Temm. Pl. Col. 445. Fulvus, dorso, alis, caudaque cinereis; crisso fasciaque alarum albis. ♀ dorso olivascens. Magnit. *Sturni*; ala 108 mill., tarsus 31. Rostrum nigrum, pedes pallidi. Ala et rostrum rectum præcedentis; cauda aqualis.

I have only seen this species once, but without procuring it. The above measurements, &c. are taken from two specimens which came from Calcutta at a later period (1832). It is evidently not rare there, and even occurs in Java.

6. *Ceblepyris lugubris*, n. Obscure cinerea, alis caudaque nigris; rectricibus gradatis, apice albis. Remigibus quibusdam macula alba interne notatis. (Affinis *C. fimbriata*, Temm., differt colore caudæ.)

♂ adult. (Mus. Lund, simul cum ♀ infra descr. e Calcutta 1832.) Nigro-cinereus, loris paullo obscurioribus; subtus paullo dilutior, immaculatus, crisso obsolete pallide undulato, tectricibus caudæ inferis apice albidis. Alæ paullo ænescentes; tectrices superiores omnes concolores; inferiores colore dorsi; remige 3a reliquis longiore, 4a macula parva alba punctata, paullo ante medium pogonii interni; 5a macula adhuc minore. De cætero ala immaculata. Rectrices laterales 22 millim. mediis breviores, apice long. 14 millim. pure albæ; mediæ reliquas superant, margine apicis albo. Rostrum et pedes nigro-fusci. Long. $6\frac{1}{2}$ poll.; ala 114 millim., tarsus 20, cauda 100; rostrum ex imo ang. frontis 16; altit. 6. Lingua apice leviter bifida seu incisa, nec lacera.

♂ (Serampore 15 Febr.) a priori differt, remigibus 3—5 subæqualibus, macula majori alba, marginem internum attingente. Alarum tectrices quædam tenue albo marginatæ.—♀? (Mus. Stockh.) Subtus ad rostrum usque obsolete albido undata, crisso alarumque tectricibus inferioribus fere albo nigroque fasciatis. Genæ albido punctatæ. Remiges tenuissime albo marginatæ; 4a reliquis longior; 3—6 intus plaga majori alba. Ala 125 mill., tarsus 22, rostrum e fronte 17. Cætera ut in ♂*.

I have myself only seen in Bengal the male above described, which was shot in a tree, February 15, almost the same instant that I saw it. It had only eaten insects. The species of this genus resemble the Thrushes, and are very numerous in Africa, South Asia, and Australia†. They have a very curious structure

* This is the *Volvocivora melaschistos* of Hodgson, and is in all probability identical with *Ceblepyris fimbriata* of Temminck, although M. Sundevall makes them distinct.—H. E. S.

† The Mexican *Hypothymis chrysorrhæa*, Licht., Temm. pl. 453, probably comes nearest to this genus. But I have as yet had no opportunity to examine it.—C. J. S.

of feathers in the hind part of the back, which are pointed like spines. The quills of the feathers are remarkably thick and hard, and taper suddenly to a fine point. They do not however terminate there, but continue a little further with a uniform thickness. This continuation however, is slender and so soft, that it gives not the least resistance to a slight pressure; whereas the hard part has the appearance of a pointed spine. This structure is identical in the African, Asiatic and Australian species, so that no geographical subdivision of the genus, such as some have attempted, can be made.

[To be continued.]

XIV.—Remarks on some Points in the Structure of Cucurbitaceæ.

By J. E. STOCKS, M.D., Assistant Surgeon on the Bombay Establishment.

STEM.—Examining the pentagonal stem of *Cucurbitaceæ* we find the disposition of its leaves to be the quincunx ($\frac{2}{5}$), and the angles to be chiefly formed by the main nerve of a leaf, which does not proceed from the nodus at which that leaf is situate, but is given off from the axil of the fifth leaf below, or in other words, the leaf which, on reducing the part to the state of bud, would be *immediately* below.

Numbering the leaves: the nerve from the axil of leaf 1 becomes the main nerve in the petiole of leaf 6, but previously two offsets are detached, one to the tendril side of leaf 3, which forms one of the side nerves of the petiole, previously supplying the tendril, and one to form one of the lateral nerves of the petiole of leaf 4 on that side which is destitute of tendril. Now 3 and 4 are the leaves immediately to the right and left of leaf 1, and the main nerve proceeding from their axils gives off the lateral nerves to the petiole of leaf 6, from one of which is detached a branch to the tendril. It may be deduced that each leaf consists of three parts, one adhering to the stem and forming a part of it, having elongated with its elongation, and widened together with it—the stem-clasping or stem-sheathing part; one the free part, including petiole and blade; and at the junction of these on each side a process or auricle called stipule, which, in *Cucurbitaceæ*, is cirrhose and exists on one side only.

The three-nerved sheath has its middle nerve readily traceable to the fifth leaf below, but its side nerves on the elongation of the stem unite for some distance with the main nerve of those leaves which are situate to the right and left of it. From one of these is given off the branch to the cirrhose stipule.

STAMENS.—The perianthium has its leaves five in a whorl, the ovarial leaves are generally three. Hitherto the stamens have

been considered to agree in number with the former, four of them uniting by pairs and so leaving the odd one free ; and this view is favoured by the occurrence of transitions from the complete union both of anther and filament through various stages to the complete independence of all the five members, such as exists in *Luffa pentandra* even as to vascular bundles. According to this view, each anther has a continuous, generally anfractuose loculus, with a median fissure following its curves, and a longitudinal septum (!) which must represent the connective or middle line of the anther, from which, on this supposition, the anther-valves in *Cucurbitaceæ* must separate. Moreover, on this view of the structure, the loculi of adjacent anthers are bent in opposite directions. But in *Coccinia indica* there are always six such serpentine loculi united by pairs, and in *Citrullus Colocynthis* and *vulgaris* there are as often six as five, the supplementary one frequently not quite so anfractuose as the others. It is by no means a necessary deduction that six is the normal, and five the reduced number of the staminal leaves.

The three-lobed, waxy, nectar-secreting disc so universally present in *Cucurbitaceæ* deserves attention ; which in the female flower might be supposed to represent the stamens, were it not for the constant presence of anantherous filaments, whose situation and sometimes the anthers developed on them (*Citrullus*) point them out as the sterile stamens. In some this disc is adherent to the calyx, in others free ; in this latter case it is perforated by the style in the female flower, but in the male forms a button in the centre of the flower—the abortive ovary of some. It is manifestly a degeneration of the same part in both male and female flowers, and from its constantly presenting three divisions we gather that it represents an inner whorl of three staminal leaves. In *Momordica Charantia* it sometimes develops a flat, coloured body bearing pollen on its edge.

Three ovarial leaves and three inner staminal leaves presuppose an outer whorl of three (not six) stamens. In *Cucurbitaceæ*, then, the inner whorl of stamens is indicated by a disc, and the number of its leaves by the divisions of that disc. The outer whorl is of three leaves, whose blade is abortive, and whose anther-cells are developed on the auricles of the sheath-part of the leaf, corresponding to the tendrils of the stem-leaves, or the stigma-points of the ovarial leaves. Each staminal leaf is of two parts as the stigma-points are two, and as the tendrils (stipules) are two ; and as in the stem-leaves one tendril is suppressed, so also in the staminal leaves one of the six loculi is generally wanting, often imperfect, but in many cases developed equally with the others.

Thus are reconciled the occurrence of five or of six members

belonging evidently to a ternary whorl, their binary adhesion in some cases, their separation (even as to vascular bundles) in others, as also the opposite twisting of their loculi in contiguous members; whereas some or other of these particulars will stand in the way of other views.

OVARY.—The ovarial leaves are sometimes two (*Mukia*, *Pilogyne*), generally three.

In the three-leaved ovary we have three dissepiments proceeding from the parietes and three from the axis, which last bear the ovules on their parietal extremity.

These appearances are variously explained.

1. Dr. Lindley supposes a valvate æstivation of the carpellary leaves. According to this view, the dissepiments are spurious, three proceeding from the placenta and the three intermediate ones from the midrib of the carpels.

2. According to Schleiden's views, the placental dissepiments must be regarded as prolongations of the axis, extending into the cavity formed by carpellary leaves with an induplicate æstivation. This opinion was long ago (1823) taken by St. Hilaire.

3. Dr. Wight supposes the carpellary leaves to have a reduplicate æstivation, and the cavity of the ovary to be completed on one side by the calyx. The intermediate or primary dissepiments would have to be regarded as spurious.

4. Arnott (*Prodromus Fl. Pen. Ind. Orient.*) and Endlicher (*Gen. Plant.*) describe the carpels of *Cucurbitaceæ* as involute.

The evidence afforded by dissection and by analogy proves the correctness of the last of these views.

1. In many *Cucurbitaceæ* whose corolla is conical in bud, the æstivation of the upper part of the corolla is beautifully involute, and presents a remarkable similitude to the young ovary: so that the bending of the carpellary leaves is not a forced explanation, but is just what happens in *Cucurbitaceæ* when the floral leaves meet in the axis.

2. In those Cucurbitaceous fruits whose vessels lignify and whose cells encrust, we can trace the leaf-skeleton following an involute course, and in none better than in many species of *Luffa*. Breaking off the outer shell (calyx) we come to a fibrous layer which runs externally chiefly round the fruit, and internally from top to bottom. This sends in processes at three points only (primary or barren dissepiments), which after meeting in the axis turn outwards into the cavity of the ovary and bear the seeds. In *Luffa pentandra*, just before hardening has commenced, on removing the operculum the primary or barren dissepiments are plainly seen to be composed of two layers when we examine them at the apex of the fruit where seeds are not developed, and less plainly below, owing to the pressure of the seeds which indent

the inflected sides of the carpels and lie imbedded each in their own cell.

3. In *Citrullus Colocynthis* and others, when we carefully dissect off the rind of the fruit, we find the placentæ forming a continuous line from the top to the bottom, perfectly free from any attachment to the rind or to the pulp, and splitting down the centre without force so as to divide each placental dissepiment into two.

It may be remarked that the three columns of pulp in *Coccinia indica*, which Dr. Wight regards as representing the carpellary leaves, are each divided into two other columns by a double line of vessels (the primary dissepiments) which can be traced following the usual involute direction and end in the placentæ.

STYLE AND STIGMA.—In the style the carpellary leaf has an induplicate æstivation, leaving in many cases a style-canal. The style-column diverges into its three parts, and each of these ends in two stigma-points which are connected by a crescentic line of stigmatic tissue looking outwards. The styles are opposite to the seminiferous, and alternate with the primary dissepiments; and the stigma-points when close together are immediately on each side of the secondary or seminiferous dissepiments; but when much diverging, those of adjacent carpels are close together and opposite the primary dissepiments.

ARILLUS.—A seed is said to have an arillus when the parenchyma in which it is imbedded becomes pulpy and adheres to its surface; but the term should be cancelled if we regard the origin of the part, for it does not grow from the placenta over the seed, but is merely the cellular tissue in which it nestles. In *Luffa* and *Citrullus* it is a mere scarious membrane which soon peels off; in *Coccinia*, *Momordica*, *Trichosanthes*, a red pulp; in *Pilogyne* a gelatinous nidus.

Examining *Coccinia* when half-ripe we find vascular parchment-cells, inside which are the seed and a waxy substance which afterwards becomes the soft arillus, while the parchment-layer with its vessels becomes flexible and offers no resistance to the separation of the seeds. In *Luffa*, the layer to which the vessels are more immediately attached remains dry and membranous in the lignified pepo, and it is chiefly the epidermis of the carpellary leaf which becomes the filmy fugacious covering of the seed.

In *Trichosanthes* again the pulp breaks up, and a portion adheres to each seed, in which we can trace the vascular layer of the carpellary leaf, and internal to it the pulpy layer, and more internal still a thin membrane, which we may regard as the epidermis or that part which is seen covering the seed of *Luffa*.

XV.—*Horæ Zoologicae*. By Sir WILLIAM JARDINE, Bart.,
F.R.S.E. & F.L.S.

No. VIII. *Ornithology of the Island of Tobago.*

THE ornithology of the West Indian Islands, considered with regard to their relation to each other and with the continents of North and South America, has been much neglected, and although large collections have been brought to Europe from different dependencies, no attempts have been made to insulate them, if we may so express it, or to point out the species prevalent or peculiar to the different islands; the migratory birds from those which are resident in each; or their general affinity with those of the mainlands or adjacent islands.

The West Indian Islands form an archipelago cut off from the continent by greater or lesser distances. Some are of very large extent, while others are of comparatively limited bounds, and they exhibit an ornithology sometimes quite distinct from each other, and in a few instances remarkably peculiar. Some of these islands serve as a refuge for the migratory species of the northern continent and receive them; some again have as it were only a partial share of the birds of South America; but all our consignments have been so distinct, or as we have termed it, "insulated," that we consider any materials that tend to throw light on the geographical distribution throughout the group will be of service to ornithology.

To the exertions of Mr. Kirk, who has now resided above twenty years in Tobago, and who has taken a lively interest not only in natural history but also in the commercial abilities of the island, and who has always shown himself anxious to apply his information of the former gained entirely by his own application to one of its most important uses, the improvement and cultivation of the numerous and most valuable products which enter into the exports of those colonies, we have been indebted from time to time for a large collection from the above-named island, which though a minor member of the group, has yielded an ornithology both varied and highly interesting. And while correspondents in four or five of the other islands may hereafter enable us to give extensive lists, we think that we are now only doing justice to the zeal of our friend in publishing a correct notice of the species which he has forwarded to us, some of them we believe hitherto undescribed.

Tobago is situate at comparatively no great distance from the eastern corner of the northern part of the great southern continent of America, having the much more extensive island of Trinidad within sight, and lying between it and the mainland. The

ornithology of this island is of a mixed character, and though leaning most to the forms of South America, it wants both some of those splendidly plumaged genera which give to that division of the world a character, and which are cut off from it as it were by Trinidad; but it at the same time presents a few forms of the northern continent, some of which do not ever, so far as we know, reach the mainland opposite. Before entering into a detailed list of the species sent from this island, the following short notice of its physical characters, extracted from a report drawn up from materials furnished by Mr. Kirk and Dr. Hope of the island, and submitted to his Excellency the Governor-General in 1843, may be of use in contributing to our knowledge of the distribution of the birds that have been met with there.

"Tobago is about twenty-three miles in length, and averages four and a half in breadth, not exceeding in its widest part seven miles. An elevated ridge, called the 'Main ridge,' rises very abruptly on the north-east, and runs longitudinally from north-east to south-west, exhibiting an undulating but nearly uniform appearance for about two-thirds of its whole length, while the general surface of the island is very uneven, presenting the appearance of a congregated mass of hemispheroidal hills of various heights and dimensions. This mass of hills may be divided into three classes, the highest of which ranges from 1800 to 2000 feet, the middle 500, and the third about 250 above the sea level. In general the hills of the middle and third classes appear to be united at the base, forming rich alluvial ravines of various extent. The highest class of hills is united by ridges approximating their summits, and constituting the high lands of the country, mostly covered by forests of noble trees containing much valuable timber. Such is the general surface of the island, to which one exception only of any note occurs in the instance of the 'Sandy Point district,' an extensive plain situate on the south-western extremity, having a soil of a loamy nature resting upon clay or coral very productive in favourable seasons.

"Several rivers and streams take their rise from the higher parts of the island, but from its limited extent their courses cannot be of any great length, though some of them are broken by falls of considerable magnitude. One of the branches of the Queen's river has its source from a small lake about 300 feet below the highest point of the main ridge, whence indeed nearly all the streams descend, and the south side of the island is so diversified with ridges and hollows, and so beautifully watered, that nearly every valley contributes its quota to the main stream.

"The climate of the island, so far as its agriculture is concerned, is as favourable as that of any island lying within the tropics, but owing to the elevation there is a considerable range

of temperature, with seasonable alternations of wet and dry throughout the year, the high and uncleared state of the lands perhaps causing more rain than is desirable. Mr. Kirk has spent several nights on the elevated parts of the main ridge, especially about the sources of the Queen's river, and found it there intensely cold towards the morning. And while the thermometer suspended from a tree there stood at 64° , the average in dwelling-houses was about 83° .

"Winds from the south-east prevail for nine months, and are succeeded from the month of November until February by northerly and north-easterly winds, productive of a depression of the thermometer to 69° in places only 450 feet above the level of the sea."

In an island so limited in extent as that of Tobago we are prepared to find only a small number of raptorial birds, and although we have reason to believe that there are one or two additional species met with at least occasionally upon the island, our collections contain only four, two of which are forms of the southern continent; one has its head-quarters in the northern, but extends also to several of the islands; and the fourth, an owl, is to a certain extent common to both.

MORPHNUS URUBITINGA, Cuv. s.*

Several birds have been received chiefly in an immature state, deep brown above, marked with ochreous yellow and pale rufous principally on the lower parts and on the upper tail-covers. The figure in the 'Planches Coloriées' represents well this condition. Some of those in this plumage are marked females, and one is mentioned as having weighed three lbs. imperial. Our adult specimens are entirely black, except the upper tail-covers, middle and tip of the tail-feathers, which are white, and the quills at the base and secondaries, which are barred with dull gray. None of the feathers on the body, but those on the occiput only, exhibited any white underneath when raised, as stated of the "*Negro*," No. xx. of Azara, and which we believe has been considered as identical with the Urubitinga.

The Urubitinga is a southern form. According to D'Orbigny, "it extends over a very large portion of the South American continent (but only to the east of the Cordilleras) in the level regions, which are interspersed with forests and extensive marshes, and still more in the vicinity of stagnant waters and limited flats. In the province of Corrientes we have always observed it by the borders of lakes, marshes or rivers, perched on the highest part of dead or dying trees, where it hunts, or upon the lower branches

* Species marked n. are also found in North America; s. in South America; and n. s. in both.

of large trees when about to sleep. Silent, always alone, it remains without motion for hours together, attentively surveying around to discover some prey,—a reptile, small quadruped or dead bird, on which it descends with rapidity, devours, and returns slowly to its watching-place. The Urubitinga lives principally on reptiles, small animals, dead birds, and perhaps fishes; it does not attempt to pursue birds, and we believe it only attacks those that have been previously hurt or wounded."

Mr. Kirk in answer to our inquiries thus writes of the Urubitinga in Tobago:—"The Urubitinga is a very plentiful species in the windward part of Tobago, especially among and on the borders of our high woods, where a few may be met with at all periods of the season; but whether from a greater scarcity of food in the interior towards the spring months I am not prepared to say at present, but certain it is that there are two for one in the months of April and May compared with any other month in the year, and generally always about the margins of rivulets. They soar extremely high at times, principally early in the morning or late in the evening, but during the day they are generally seen on the low boughs of a tree, and although I have seldom met with two together, they will nevertheless readily answer the whistle, and immediately descend from a very distant eminence if within hearing of the call. Unlike most of their tribe they are unsuspicious, seldom perching upon the top of the tree, but on some low branch, and I have often in the above way brought them within the range of shot. I once shot one with a purple gallinule in his talons, with which he rose from the ground; I took a small bird from the stomach of another, and I have killed upwards of twenty, but invariably found in all either entire snakes or fragments of them; at times quite entire and upwards of four feet long, principally what we call the 'whip snake.' Their note is one prolonged whistle."

SPIZAËTUS ORNATUS, Vieill. s.

This beautiful species does not appear very common in the island. In all we have only received three specimens, and Mr. Kirk has not had an opportunity of attending to its habits. In one, from its size a female, the crown, back and scapulars are nearly black, the feathers of the latter narrowly edged with white; the cheeks and sides of the neck bright orange-coloured brown; the lower parts and thighs very broadly barred with black. In another, probably a male, the long feathers of the crest are black, so also are a few feathers on the back and scapulars, which are narrowly edged with gray; the under parts nearly pure white; the head, cheeks, sides of the neck and nape pale orange-coloured brown inclining to yellowish, the feathers darker in the centre,

and upon the crown streaked along the shafts with umber brown. Mr. Kirk's note accompanying this: "The only one with the top that has been met with here, though this island possesses several somewhat similar. I shot this far in the interior of the woods. Weight three lbs. imperial; eyes dark blue; cannot say what sex."

FALCO COLUMBARIUS, Linn. N.

"Chicken Hawks, very daring birds," is the only observation we have upon this bird, although from the number of specimens received we should judge it to be a common species, specimens of both sexes in mature, immature and intermediate plumage having been sent. This bird is a northern species and is the representing form in America of the European Merlin. The *F. æsalon* of the Northern Zoology and *F. temerarius* of Audubon are both referable to the American bird, which seems also to range far to the southward, although we are not aware whether it reaches the main land parallel with Tobago. We possess a specimen from the island of Jamaica.

OTUS AMERICANUS, Bonap. N. S.

"Native. Seldom or never come to the civilized part of the country, their food being found chiefly towards the interior or about the skirts of the woods. The stomach contained the bones and bristles of a large musk rat. Weight (a male) nine oz. imperial."

Of Insessorial birds we shall find a large proportional number.

PODAGER NACUNDA, Vicill. S.

We have only received one specimen of this curious form, and would request Mr. Kirk's attention to its habits. It is known by the figure of Temminck under the name of *Caprimulgus diurnus*, by which it is also mentioned in the 'Travels' of Prince Neuwied, who met with it in Brazil. Said to frequent open plains rather than the vicinity of woods, and to feed at an earlier period of the evening than the true night-hawks, whence Temminck derived his name.

Mr. Kirk observes:—"Large Jumbie bird, male, shot in a low-lying situation at the leeward of the island on the 19th September 1833. They are migratory, arriving with or before the plover, making their stay a little longer; only to be found in the west end of the island."

CHORDEILES LABECULATUS, Jard. S.

A single specimen only of this small Chordeiles was received, and we have been unable to refer it to any figure or description,

while the principal collections in this country do not seem to possess it. The figure which we have found nearest to it is that of *Caprimulgus hirundinaceus*, Spix, iii. fig. 1, but it differs in the tail being represented even and in the throat without any white. Mr. Kirk's species from its markings is a female. In extreme length to the outer feather of the tail, which is slightly forked, only $7\frac{1}{2}$ inches. Above, minutely varied with black, pale rufous and grayish white; wing-covers with an irregular oval white spot at the tips of the outer webs, which appears rather conspicuously; the secondaries tipped with pale rufous, forming a bar across; the quills irregularly barred with the same colour, the bars becoming more indistinct on the outer webs of the first three, and disappearing on both webs towards the tips (the first and second quills are wanting in our specimen, but from the appearance of the third the markings would be somewhat as we have stated); the throat is reddish white and the remaining under parts pale rufous, distinctly barred transversely with black, except across the breast, where the markings become more indistinct and present a band across of mottled gray, black and rufous.

In looking over some birds from South America belonging to Dr. Armstrong of the Naval Hospital, Devonport, we found a small male *Chordeiles* resembling the Tobago bird, and comparison since has induced us to refer it to the same. The markings on the wings and under parts are nearly similar, only that there is less rufous, and the spot on the throat and those on the inner webs of the quills are white. The crown is strongly marked with black, the tips and centres of the feathers being of that colour, and the upper parts exhibit a very minute and beautiful pencilling, a gray tone prevailing over the whole.

We have no notes attached to Mr. Kirk's bird, but it is more than probable also a migratory species from the continent.

CAPRIMULGUS CAYENNENSIS, Gmel. (Junco Bird.). s.

It was from Mr. Kirk's specimens that the figure of *C. leopetes* was given by Mr. Selby and myself in the 'Ornithological Illustrations,' but there can be no doubt that the bird in question is the Crapaud-volant de Cayenne, figured Pl. Enl. 76. It seems to be the common species in the island, and its manners approach very near indeed to those of our native goatsucker. Mr. Kirk observes, "This bird is not migratory, but remains with us all the year; they are seldom to be seen during the day, but wherever there is a dark solitary valley abounding with brushwood or long grass, and if any clear pasture or cart or foot road in the vicinity, on such pasture or roads at the commencement of twilight or rather later they are sure to be found. In such a place I saw one about a fortnight ago; next night I took my station at the same place, resolved to have it as well as to study its manners. At this

time their whistle is two notes resembling the words 'whir whir,' the first uttered quickly and the latter with a considerable accent and a prolonged sound of several seconds, similar to the whistle of a shepherd to his dog when he does so through his teeth: I can imitate this so exactly as to be answered whenever the twilight commences. From the darkness of their retreat I could not see them, but when they answered my call could perceive them to be stationary, and I have formerly seen them sitting on the ground, uttering their note in the Glamorgan pasture, which was very bare. There also I have seen them performing their evolutions in the air, and producing their buzzing sound like that of a wool spinning-wheel; the last I shot was the only one I ever saw settle upon a tree. I observed that they ceased to answer me whenever they took to wing, but in passing and repassing me in their gliding circles, sometimes coming within a yard or two of my head, they invariably utter a gentle cheep once repeated. If a pair, when one was dropped the other disappeared, and could never be prevailed upon to answer the call for that evening."

PROGNE DOMINICENSIS, Gmel. s.

This Swallow appears to be a migratory visitant to several of the West Indian islands, and to occupy there the place of the *P. purpurea* of the northern continent, being known by the same familiar name of "Purple Martin." Brisson described it from St. Domingo, and we have received Jamaica specimens from Dr. Parnell.

Mr. Kirk states his specimens were shot on the 24th February, but "the exact date of arrival and departure I have not yet ascertained. There are still (14th August) a few here, they feed on the Cantharides fly, and commence to build in the beginning of May. Observing a number of them sitting upon the wreck of a large vessel cast upon our shore, pluming and adjusting their feathers, on my approach they gave signs of great uneasiness, which increased as I proceeded, until I went to the nest, when they hovered over and within three feet of my head while I was drawing out from the crevices their large nest, composed of sticks, tree leaves, old oakum from the vessel, and thickly bedded with large downy feathers. I saw no young, and indeed it seems strange that they should attempt to build there, when in the least rough weather the surf breaks right over. I observe they build around our coast on all the precipitous rocks."

ACANTHYLIS BRACHYURA, Jard. (Chimney Swallow). s.

Hirondelle à queue pointue de la Louisiane, Pl. Enl. 726. fig. 2?

Hirundo poliurus, Temm., Tab. Méthod. p. 78?

It is probable that the Tobago specimens of *Acanthylis* may

hereafter be referred to the synonymys we have provisionally used above; at all events it must be a species closely allied to that of Buffon's figure, distinguished by its short tail and lengthened wings, and we add a description to facilitate comparison. Head, back and wings black, with a slight gloss of green; lower back, rump and upper tail-covers pale grayish brown; tail dark grayish brown, but entirely hid by the long upper and under covers which conceal it, except the sharp tips of the black shafts which project about $\frac{1}{2}$ and $\frac{1}{2}$. The breast and belly is dull black, the chin grayish black. The entire length of two males to the end of the sharp shafts of the tail-feathers is $3\frac{1}{2}$ and $3\frac{9}{12}$. That of the wing is nearly alike in both, $4\frac{11}{12}$ or $\frac{9}{12}$.

"Shot 18th February. This bird is seldom seen very early or late; they are abundant at noonday in mild weather, when they sweep round our buildings like the European swallow, but seldom use the sharp twitter so common to it. On their first appearance (A.M.) they are generally soaring very high, so that I cannot say where they come from, but at noon a hundred may be seen for one at 8 A.M.; I am led to believe they roost in the woods; I remember several years ago in the month of August, while amusing myself with an evening walk, on looking at a tall palm which had been in a state of decay for years, on giving it a sharp stroke with a stick, to my surprise there issued forth a body of birds as fast as the aperture would admit, ascending straight up like a column of smoke until they darkened the air around. My idea at that moment was that they were bats, but subsequent observations have induced me to believe that they were chimney swallows collecting for emigration. I shall now endeavour to observe the time and manner of departure. There are still (14th August) stragglers to be seen flying about, but very high."

[To be continued.]

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

March 24, 1846.—Wm. Yarrell, Esq., Vice-President, in the Chair.

The following paper was read, entitled "Descriptions of new species of Shells," by Dr. J. H. Jonas:—

CUCULLÆA GRANULOSA, Jonas. *Cuc. testâ quadrato-rhombed, turgiddâ, tenuisculâ, inæquivalvi, testaceo-albâ, violuceo-rubro posticè præsertim maculatâ et flammulatâ; lateribus supernè attenuatis, angulatis, antico breviorè, infra rotundato, postico longiorè, subangulato-declivi, umbonibus acutis incurvis, carinâ ab umbone ad angulum posticum et inferum decurrente; per longitudinem densè*
Ann. & Mag. N. Hist. Vol. xviii. K

striatâ, iris striis transversalibus decussantibus subtiliter granulosis; ligamenti areâ mediocri, corio corneo nigro indutâ; intus albâ posticè violaceo tinctâ, margine serratâ, auriculâ internâ mediocri, cardinis dentibus lateralibus anticis tribus, posticis quatuor.

Long. marginis ventralis, $2\frac{1}{2}$ poll.; altit. 2; crassities, $1\frac{3}{4}$ poll.

Specimina etiam majora vidi.

Hab. In Mari Chincensi.

This shell differs from the *Cucullæa concamerata*, Martini (*Cucullæa auriculifera*, Lam.), as follows: 1. It is thinner and less transversally prolonged; 2, the elevated longitudinal striæ are not flat, and not broader than the interstices, as with the other species, appearing subtilely granulated by transversely crossing and very close striæ; 3, the ligamentary area is somewhat flatter; 4, the internal auricles are smaller; and 5, there are on the anterior side three and on the posterior four lateral teeth, whilst the other species has on each side one tooth less. (*Cardine utrinque subbicostato*, Lam.)

VENERUPIS TENUSTRIATA, JONAS. *Ven. testâ ovatâ, transversâ, æquivalvi, inæquilaterali, albâ, striis radiantibus tenuibus undulatis, sulcis incrementi distantibus decussatis, concinnè sculptâ; lateribus rotundatis, marginibus dorsali et ventrali parallelis leviterque arcuatis; lanula nullâ, ligamento longo, prominente, umbonibus parvis acutis; cardine utriusque valvæ dentibus tribus compressis; impressionibus musculorum magnis, rotundis, sinu palliari lato, profundo, semilunari.*

Long. 15, altit. 9, crassit. 6 lin.

Hab. Apud Singaporen.

Exstat in museo hon. Gruner.

The umbones are situated so near the anterior end that the superior margin of the shell almost forms the area.

FASCIOLARIA CLAVA, JONAS. *Fasc. testâ subfusiformi-clavatâ, ventricosissimâ, crassâ, ponderosâ, nodosâ, albâ, rubro variegatâ. filis fuscis transversim impresso-striatâ; anfractibus octo medio angulatis, tuberculis magnis compressis in angulo coronatis; ultimo supernè angulato et coronato, infra angulum seriebus tribus nodorum obtusorum armato; suturâ undulatâ, crispâ; caudâ spiræ subæquali, obliquè funiculatâ, rectâ, infernè subrecurvâ; aperturâ oblongo-ovatâ, intus hepaticâ, aurantio tenuissimè striatâ, labro crasso, dentato; dentibus striis externis respondentibus; columellâ cylindracâ, hepaticâ, basi triplicatâ.*

Long. $5\frac{1}{2}$, lat. $3\frac{1}{2}$ poll.

Hab. In Oc. Indiâ.

AMPHIBOLA OBVOLUTA, JONAS. *Amph. testâ solidâ, nitidâ, supernè planâ, infernè convexâ, latè umbilicatâ; anfractibus quatuor obvolutis, suturâ profundâ divisâ, transversè striatis, albis: ultimo zonis duabus latis, glaucis obsolete balleato, obtusè supernè angulato; aperturâ ovatâ, labro posticè subexciso, columellâ rectâ, callosissimâ, callo umbilicum latum pro parte tegente; regione umbilicali et callo fuscis.*

Altit. ab apice ad aperturæ basin, 8; ad ultimi anfractûs basin, 6; diameter major $10\frac{1}{2}$, minor 8; aperturæ long. $6\frac{1}{2}$, latit. $3\frac{1}{2}$ lin.

Patria, Australia meridionalis.

Exstat in museo hon. Gruner.

Schumacher was the first who in his 'Essai d'un nouveau Système des habitations des vers testacés, à Copenhague 1817,' elevated the *Nerita nux avellana*, Chemn., to a peculiar genus, which he named *Amphibola*. Lamarck ranged it among the Ampullarias, till Quoy and Gaimard separated it, after careful examination of the animal, from this genus, and instituted it the type of the genus *Ampullacera*. It appears from this that *Amphibola* and *Ampullacera* are identical, and that the first denomination has the priority.

Our species is very like to the *Amphibola avellana*, but may however be distinguished from it by the following differences:—1, it is thicker; 2, the whorls are lying in one plane, the spire is depressed, not elevated, as with the other species; and the last whorl, which almost entirely forms the whole shell, is very much drawn down; 3, it is not perforated, and although largely umbilicated, yet the other smaller whorls are not visible in the umbilic; and 4, it distinguishes itself by a very callous columella, which partly propagates over the spire, following the suture at a distance of five lines.

April 14.—William Yarrell, Esq., Vice-President, in the Chair.

The following communications were read: "Descriptions of twenty new species of *Helicea*, in the collection of H. Cuming, Esq.," by Dr. L. Pfeiffer:—

1. *HELIX SUTURALIS*, Pfr. *Hel. testa latè umbilicatâ, depressâ, subdiscoïdèd, tenui, sub lente minutissimè granulosa, fusco-corned; spirâ pland, medio subimmersâ; suturâ profundâ; anfractibus 4 convexissimis, ultimo anticè descendente; aperturâ perobliquâ, subcirculari; peristomate simplice, marginibus conniventibus, dextro recto, supernè fornicato, columellari subrecedente, arcuato, basaliqûe breviter reflexo.*

Diam. 10, alt. 4 mill.

Found at Honduras under decayed leaves by Mr. Dyson.

Nearly allied to *H. Nystiana*.

2. *HELIX CANDAHARICA*, Pfr. *Hel. testâ umbilicatâ, orbiculato-converiusculâ, obliquè striatula, nitidula, fusciscenti-albidâ, fasciis angustis, maculosè interruptis, nigricantibus et rufis ornata; spirâ vix elevatâ, apice nitido, corneo; anfractibus 5 converiusculis, ultimo anticè non descendente; umbilico infundibuliformi, anfractuum penultimum latè monstrante, medio angustissimo; aperturâ obliquâ, lunato-orulâ; peristomate acuto, intus subremotè labiato, marginibus conniventibus, columellari vix dilatato.*

Diam. 16, alt. $7\frac{1}{2}$ mill.

From Candahar, East Indies (Benson).

3. *HELIX AULACOSPIRA*, Pfr. *Hel. testâ latè umbilicatâ, depressâ, discoïdèd, tenui, irregulariter et leviter malleatâ, lineis impressis, concentricis, confertis regulariter sulcatâ, lutescenti-corned; spirâ*

pland; anfractibus 4½ depressis, celeriter accrescentibus; umbilico lato, perspectivo; aperturâ subverticali, obliquè lunato-ovali; peristomate simplice, tenui, margine columellari non reflexo.

Diam. 12, alt. $4\frac{1}{2}$ mill.

Locality unknown.

4. *HELIX GOSSEI*, Pfr. *Hel. testâ imperforatâ, orbiculato-conoided, tenui, irregulariter plicatulo-striatâ, non nitente, diaphand, fulvidâ, fasciâ unicâ periphericâ, angustâ, castaneâ, alterâque superiore obsoletâ ornatâ; spirâ breviter conoided, obtusâ; anfractibus 5 planiusculis, ultimo basi subplanulato; columellâ declivi, angustâ, pland, introrsum acutâ; aperturâ obliquâ, elliptico-lunari, intus concolore; peristomate simplice, tenui, recto.*

Diam. 16, alt. 9 mill.

From the Blue Mountains (Jamaica), under stones; found by Mr. Gosse.

5. *HELIX MONTFORTIANA*, Pfr. *Hel. testâ imperforatâ, turbinatâ, crassâ, ponderosâ, nigricanti-rufâ, epidermide fusco-cinereâ hydrophanâ indutâ; spirâ conoided, apice obtuso, nudo, nitido, violaceo-purpurascente; anfractibus 4½ vix convexiusculis, ultimo angulato; angulo anticâ evanescente; columellâ declivi, callosâ, albâ, basi subdentatâ; aperturâ subtetragond, intus nitidè albâ; peristomate breviter reflexo, nigro-fusco limbato.*

Diam. 31, alt. 22 mill.

From the Philippine Islands.

This shell appears intermediate between *Hcl. Bruguiereana*, Pfr., and *carbonaria*, Sow.

6. *ACHATINELLA ROHRI*, Pfr. *Ach. testâ ovato-conicâ, longitudinaliter striatâ, striis spiralibus, confertissimis decussatâ, albidofulvâ, fasciis angustis castaneis variè ornatâ; spirâ conicâ, acutiusculâ; anfractibus 6 vix convexiusculis, ultimo spiram subæquante, medio compresso; columellâ tortâ, callosâ, vix dentatâ; aperturâ subtetragond, intus nitidè lacted; peristomate recto, intus labiato, marginibus subparallelis, dextro supernè breviter curvato.*

Long. 24, diam. 13 mill.

From the Sandwich Islands (Capt. Rohr).

7. *ACHATINELLA TENIOLATA*, Pfr. *Ach. testâ ovato-oblongâ, solidâ, striatâ, nitidâ, albâ, fasciis variis fuscis, deorsum obsoletioribus ornatâ; spirâ conicâ, acutiusculâ; anfractibus 6 convexiusculis, ultimo $\frac{1}{2}$ longitudinis subæquante; columellâ albâ, supernè validè dentato-plicatâ; aperturâ irregulariter semiovali, intus albâ, nitidâ; peristomate extus brevissimè incrassato, intus valdè labiato, margine columellari dilatato, reflexo, appresso.*

Long. 20, diam. medio 11 mill.

From the Sandwich Islands.

8. *BULIMUS (PAETULA) AMABILIS*, Pfr. *Bul. testâ sinistrorsâ, subperforatâ, ovato-turritâ, solidâ, striatâ, nitidâ, citrinâ, apice acuto rubicundo; suturâ albo-marginatâ; anfractibus 5, supremis planis, reliquis convexis, ultimo inflato, spirâ breviorè; columellâ*

subsimplice, vix plicatâ; aperturâ oblongo-semiovali; peristomate subincrassato, albo, expanso-reflexiusculo, margine columellari lato, plano, patente.

Long. 23, diam. $11\frac{1}{2}$ mill.

β. *Paulâ minor, fasciis latis nigricanti-castaneis ornatus, peristomate fusco-livido.*

From Annaa or Chain Island.

9. **BULIMUS (PARTULA) GANYMEDES**, Pfr. *Bul. testâ umbilicatâ, oblongo-conicâ, tenui, striis incrementi crebris lincisque undulatis, confertissimis, impressis minutè decussatâ, scabriusculâ, sub epidermide citrinâ fugacissimâ albicante, non nitente; spirâ conicâ, acutiusculâ; anfractibus $5\frac{1}{2}$ convexiusculis, ultimo spiram subaequante, medio obsoletissimè angulato, fasciâ unica latiusculâ castaneâ ornato; columellâ strictiusculâ; aperturâ oblongâ, supernè obliquè truncatâ; peristomate simplice, tenui, undique latè expanso.*

Long. 23, diam. $10\frac{1}{2}$ mill.

From the Society Islands.

10. **BULIMUS (PARTULA) HEBE**, Pfr. *Bul. testâ perforatâ, globoso-conicâ, tenui, sub lente minutissimè decussatâ, hyalinâ; spirâ brevi, conicâ, acutâ; anfractibus $4\frac{1}{2}$ planis, ultimo spiram superante, globoso; columellâ brevi, subplicatâ; aperturâ latâ, subsemicirculari, callo dentiformi profundo in ventre anfractûs penultimi coarctatâ; peristomate iatus albo-callosa, undique breviter expanso.*

Long. 16, diam. 9 mill.

From the Society Islands (Mr. Mallet).

11. **BULIMUS (PARTULA) ISABELLINUS**, Pfr. *Bul. testâ subperforatâ, oblongo-conicâ, solidâ, striatâ, isabellinâ; spirâ conicâ, acutiusculâ; anfractibus 5 convexiusculis, supremis lineis impressis, spiralibus tenuissimè sculptis, ultimo spirâ paulò breviorè, basi anticè rotundatâ; columellâ albâ, plicato-gibbâ; aperturâ oblongo-ovali, callo dentiformi, profundo in ventre anfractûs penultimi coarctatâ; peristomate callosa, albo, latè expanso, reflexiusculo, margine columellari dilatato, sinuato-reflexo.*

Long. 22, diam. 10 mill.

Locality unknown.

12. **BULIMUS (PARTULA) RADIOLATUS**, Pfr. *Bul. testâ subperforatâ, oblongo-attenuatâ, apice obtuso, tenui, lineis spiralibus impressis, distantiusculis sculptâ, pallidè stramineâ, strigis saturationibus et lincis fuscis radiolatâ; anfractibus 5 convexiusculis, ultimo spiram subaequante, anticè basi tumido; columellâ brevi, breviter recedente; aperturâ obliquè ovali, intus nitidâ, flavâ; peristomate simplice, tenui, albo, expanso, margine dextro strictiusculo, columellari supernè dilatato, fornicato-patente.*

Long. 19, diam. 10 mill.

β. *Testa carnea, radiis cinnamomeis.*

From New Ireland.

13. **BULIMUS DYSONI**, Pfr. *Bul. testâ angustè perforatâ, oblongo-*

ovatâ, solidulâ, tenuiter longitudinaliter striatâ, subdiaphandâ, fusco-corned; spirâ conicâ, apice acutiusculo; anfractibus 6-6½ convexis, ultimo $\frac{3}{4}$ longitudinis subæquante; columellâ leviter arcuatâ, basin attingente; aperturâ ellipticâ, basi subangulatâ; peristomate simplice, recto, marginibus callo tenui junctis, dextro arcuato, cum columellari, supernè dilatato, fornicatim reflexo, angulum formante.

Long. 20, diam. $9\frac{1}{2}$ mill.

From Honduras (Mr. Dyson).

14. *BULIMUS CANDELARIS*, Pfr. *Bul. testâ sinistrorsâ, profundè rimatâ, cylindraced, apice sensim attenuato, acutiusculo, suboblique striatulo, sordidè albo; anfractibus 9 planiusculis, ultimo minus obliquè descendente, $\frac{1}{2}$ longitudinis vix æquante, basi subrotundato; aperturâ semiovali, intus nitidâ, albâ; peristomate albo, undique expanso, marginibus callo tenui junctis, columellari dilatato, patente.*

Long. 27, diam. 8 mill.

Locality unknown.

15. *BULIMUS GUERINI*, Pfr. *Bul. testâ imperforatâ, oblongo-ovatâ, tenuiusculâ, irregulariter rugoso-striatâ, fulvo-fuscâ; spirâ conicâ, obtusâ, pallidius fulvidâ, strigis et maculis rufis ornâtâ; anfractibus 5 convexiusculis, ultimo spirâ paulò longiore; columellâ lutescente, arcuatâ, supernè subtortâ; aperturâ acuto-ovali, intus nitidissimâ, plumbeâ; peristomate breviter reflexo, lutescente, basi cum columellâ angulum indistinctum formante.*

Long. 41, diam. $18\frac{1}{2}$ mill.

From New Granada.

16. *BULIMUS INDICUS*, Pfr.—*Achatina gracilis*, Benson, MSS.—*Bul. testâ subperforatâ, subulatâ, tenui, diaphandâ, corneo-cerâ, subarcuatim confertissimè striatâ; spirâ subulatâ, apice acutiusculo; anfractibus 8 planiusculis, ultimo $\frac{1}{2}$ longitudinis subæquante; columellâ rectâ, verticali; aperturâ oblongâ; peristomate simplice, acuto, margine columellari usque ad basin breviter reflexo, perforationem ferè tegente.*

Long. 10, diam. $3\frac{1}{2}$ mill.

From East India.

17. *BULIMUS KIENERI*, Pfr. *Bul. testâ breviter rimatâ, cylindraco-turritâ, tenui, obliquè confertim costatâ, fusco-corneo et albido irregulariter marmoratâ; spirâ turritâ, apice acutiusculo nigricante; suturâ profundâ, crenatâ; anfractibus 13 convexis, ultimo $\frac{1}{2}$ longitudinis subæquante, basi obsoletè unicarinato; aperturâ lunato-circulari; peristomate simplice, undique expanso, marginibus conniventibus, dextro perarcuato, columellari dilatato, patente.*

Long. 18, diam. anfr. antepenult. 6 mill.

From Honduras (Mr. David Dyson).

18. *BULIMUS MARTINICENSIS*, Pfr. *Bul. testâ rimato-perforatâ, oblongo-turritâ, obliquè striatâ, solidulâ, lutescenti-corned; spirâ turritâ, obtusiusculâ; anfractibus 7 convexis, ultimo $\frac{1}{2}$ longitudinis*

vix superante; aperturâ ovato-oblongâ; peristomate breviter expanso, intus albo-labiato, labio extus pellucente, marginibus subconvergentibus, dextro arcuato, columellari dilatato, patente.

Long. 20, diam. 8 mill.

From the island of Martinique (Petit).

19. *BULIMUS NILAGIRICUS*, Pfr. *Bul. testâ rimato-perforatâ, oblongo-turritâ, solidâ, opacâ, lineis impressis confertissimis subundulatis obsoletâ sculptâ, fuscâ, albido obliquè strigatâ; spirâ regulariter turritâ, apice obtusiusculâ; anfractibus 8 vix convexiusculis, ultimo $\frac{1}{2}$ longitudinis subæquante, basi subcompressa; aperturâ ovali; peristomate expanso, latè albo-labiato, margine dextro supernè subangulato, columellari usque ad basin dilatato, patente.*

Long. 28 $\frac{1}{2}$, diam. 8 mill.

From the Neelgherries, East Indies.

20. *BULIMUS ZONULATUS*, Pfr. *Bul. testâ perforatâ, oblongo-conicâ, tenui, lavigatâ, opacâ, pallidè stramineâ, seriebus 2 macularum fuscârum pellucidarum cinctâ, basi lineis 2 castaneis ornatâ; spirâ conicâ, acutiusculâ, apice corneo; anfractibus 6 convexiusculis, ultimo spiram vix superante; columellâ strictâ; aperturâ ovali-oblongâ; peristomate acuto, tenui, margine columellari a basi dilatato, membranaceo, angulatim latè reflexo, perforationem ferè occultante.*

Long. 18, diam. 9 mill.

From Cabanatuan, province of Nueva Ecija, island of Luzon; found by Mr. H. Cuming.

"Description of nine new species of *Helicea*, collected by H. Cuming, Esq.," by Dr. L. Pfeiffer:—

1. *HELIX LUCIDELLA*, Pfr. *Hel. testâ minutâ, perforatâ, depressâ, striatâ, nitidissimâ, brunneâ; spirâ subplanulatâ; suturâ albo-marginatâ; anfractibus 4 planis, ultimo basi vix convexiore, medio impresso, angustissimè perforato; aperturâ obliquè lunari; peristomate simplice, obtuso, margine columellari declivi, vix incrassato.*

Diam. 3 $\frac{3}{4}$, alt. 2 mill.

Found on the island of Luzon.

2. *HELIX ARCTISPIRA*, Pfr. *Hel. testâ umbilicatâ, depressâ, subdiscoideâ, confertim costatâ, albâ, epidermide tenui fuscescente indutâ; spirâ convexiusculâ; anfractibus 5 $\frac{1}{2}$ convexis, angustissimis; umbilico lato, perspectivo; aperturâ parvâ, subverticali, lunato-orbiculari; peristomate simplice, acuto.*

Diam. 2 $\frac{1}{2}$, alt. 1 $\frac{1}{4}$ mill.

From the island of Juan Fernandez.

Intermediate between *H. epidermia*, Aut., and *tessellata*, Mühlf.

3. *HELIX CYATHELLUS*, Pfr. *Hel. testâ umbilicatâ, conicâ, obliquè costatâ, tenuiusculâ, unicolore corneâ; spirâ pyramidatâ, acutiusculâ; anfractibus 9 angustissimis, carinâ filiformi cinctis, ultimo basi planiusculo, sublavigato; umbilico majusculo, pervio; aperturâ depressâ, angulato-lunari; peristomate simplice, margine supero brevi, recto, basali leviter arcuato, brevissimè reflexo.*

Diam. $5\frac{1}{3}$, alt. 4 mill.

From the island of Panay.

4. *HELIX DOLIOLOM*, Pfr. *Hel. testâ perforatâ, turbinatâ, confertissimè et minutè costulato-striatâ, pellucidâ, non nitente, cornedâ; spirâ turbinatâ, apice obtusiusculâ; anfractibus 5 convexiusculis, ultimo basi subplanato; aperturâ depressâ, latè lunari; peristomate simplicissimo, recto.*

Diam. $3\frac{1}{2}$, alt. $2\frac{1}{2}$ mill.

From Sibonga, island of Zebu.

5. *BULIMUS DILATATUS*, Pfr. *Bul. testâ imperforatâ, ovato-conicâ, obtusiusculâ, solidâ, obliquè striatâ, subtilissimè punctatâ, castaneâ, supernè fulvâ; anfractibus 6 planiusculis, ultimo ad suturam albo-unifasciato, spirâ multò breviorè; columellâ subrectâ, callosâ, albâ, dilatâtâ; aperturâ obliquâ, latè semiovali, intus lacteâ; peristomate subincrassato, expanso, margine basali reflexo, appresso.*

Long. 34, diam. 22 mill.

Island of Luzon.

6. *BULIMUS ELONGATULUS*, Pfr. *Bul. testâ imperforatâ, subulatâ, solidâ, sub epidermide tenuissimè striatâ (interdum obsoletè decussatâ), albâ; spirâ subulatâ, acutâ; anfractibus 8 planiusculis, ultimo tertiam longitudinis partem ferè æquante; columellâ breviter recedente, callosâ, planâ; aperturâ oblongo-ovali; peristomate simplice, margine dextro antrorsum subarcuato, columellari subincrassato, appresso.*

Long. 24, diam. $5\frac{1}{2}$ mill.

Island of Luzon.

7. *BULIMUS GRATELOUPI*, Pfr. *Bul. testâ imperforatâ, ovato-oblongâ, ruguloso-striatâ, tenuissimâ, nitidâ, pellucidâ, stramineo-albidâ; anfractibus 6-7 convexiusculis, ultimo spirâ paulò breviorè; columellâ callosâ, retrorsum flexuosâ; aperturâ semiovali; peristomate simplice, acuto, margine dextro antrorsum arcuato.*

Long. 18, diam. 8 mill.

From the islands of Luzon and Panay.

8. *BULIMUS PHILIPPINENSIS*, Pfr. *Bul. testâ imperforatâ, ovato-turbinatâ, solidâ, nigricante, strigis obliquis epidermidis hydrophana griseo-fusca ornatâ; spirâ conicâ, obtusiusculâ, nudâ, pallidâ; anfractibus 6 convexis, diametro celeriter accrescentibus, ultimo spirâ paulò breviorè; columellâ vix obliquâ, subtortâ, carinâ; aperturâ lunato-orbiculari, intus lacteâ; peristomate subincrassato, breviter reflexo, nigro-limbato, margine dextro valde arcuato, columellari dilatato, expanso.*

- β. *Testa epidermide fusca, saturatius strigata ferè omninò obducta, fasciis variis nigricantibus circumdata.*

Long. 63, diam. 41 mill.

From the islands of Luzon and Marinduque.

9. *HELIX REEVANA*, Pfr. *Hel. testâ umbilicatâ, subdiscoideâ, tenuiusculâ, obliquè striatâ, albâ, zonis 3-5 rufis ornatâ; spirâ vix*

convexusculd, obtusâ; anfractibus 4½-5 planiusculis, ultimo anticè subito deflexo, basi concentricè et confertim striato; umbilico mediocri, pervio; aperturâ subhorizontali, transversè ovali; peristomate subsimplice, reflexo, marginibus junctis.

Diam. 30, alt. 12 mill.

Island of Zebu.

This shell has been often mistaken for *H. Lasallii*, Eydoux, and is in many collections under that name; but *H. Lasallii* is not this species. It is quite congruent with *H. meretria*, Sow.

May 12.—Richard C. Griffith, Esq., in the Chair.

Mr. H. E. Strickland exhibited a species of *Corvus*, discovered by Capt. H. M. Drummond, 42nd R. H., which the latter gentleman proposes to name *Corvus collaris*. In size and form it is closely allied to the Common Jackdaw, *Corvus monedula*, but differs in the much lighter silvery grey of the cheeks, occiput and nape, which passes into a well-marked patch of pure white on each side of the neck. The black on the crown is of less extent than in *Corvus monedula*, and the lower parts are of a slaty grey.

Capt. Drummond states that in Macedonia and Thessaly this bird takes the place of *C. monedula*, which is common in the south of Greece, and does not there differ from the Jackdaw of Britain.

June 9.—George Gulliver, Esq., in the Chair.

A foetal Condor, extracted from an egg laid in the menagerie, was exhibited to the Meeting. The egg had been placed under a common hen, which remained sitting on it for six weeks and two days.

The length of the specimen is 5½ inches; the extremities, particularly the legs, are imperfectly developed, but the head had acquired a specific vulturine character; a strong line of downy filaments extends along the length of each pectoral muscle; all the other parts of the body are quite bare.

	inches.
Length of the head	1¾
Length of bones of wing	2
Length of bones of leg to the end of longest toe . .	2

Mr. Gould exhibited to the Meeting three new species of the family of *Trochilidae*, which he thus characterized:—

TROCHILUS (PETASOPHORA) CORUSCANS. Troch. strigâ intense cæruleâ a mento per genas productâ in aures, quæ erectæ ut cristulæ conspicantur; plumis mediam gulum squamatum tegentibus nitide viridibus, arco et coccineo colore resplendentibus; medio abdomine cyaneo; tectricibus caudæ inferioribus sordide viridibus, ad apices stramineis; alis purpurascens fuscis.

Crown of the head, all the upper surface, wing-coverts and flanks green; tail-feathers very broad, steel-blue, with green reflections, and crossed near the extremity with a broad band of a blackish hue, as in the allied species *Anais* and *serrirostris*; a band of rich pure blue commences on the chin and extends along the sides of the

cheeks and on the ear-coverts, which when erected form conspicuous tufts; the scale-like feathers of the centre of the throat rich shining green, with bronze and dull crimson reflections; centre of the abdomen blue; under tail-coverts dull green, broadly tipped with buff; wings purplish brown; bill black; feet brown.

Total length, $5\frac{1}{2}$ inches; bill, $1\frac{1}{6}$; wing, 3; tail, 2.

Hab. The part of South America of which this bird is a native is unknown.

This beautiful species is rather less in size than *P. Anas*, from which and every other species it is distinguished by the beautiful marking of the throat, the greater extent of the blue on the abdomen, and by the greater breadth of the feathers of the tail.

In my own collection.

TROCHILUS (—?) *FLABELLIFERUS*. *Troch. capite, collo, et pectore, nitide saturate cyaneo; dorso, uropygio, tectricibus caudæ superioribus, et lateribus nitide viridibus; lato maculo ad nucham semilunari, abdomine, tectricibus caudæ inferioribus, et caudæ albis; caudæ plumis ad extremam pogoniam fusco marginatis; alis nigro-fuscis purpureo splendentibus.*

All the head, neck and chest rich deep shining blue; back, rump, upper tail-coverts and flanks shining green; a broad crescent-shaped mark at the back of the neck, abdomen, under tail-coverts and tail pure white, the feathers of the latter bordered at the extremity with brown; wings blackish brown, with purple reflections.

Total length, 5 inches; bill, $1\frac{1}{2}$; wing, 3; tail, 2.

Hab. Mexico.

Closely allied to *T. mellivora*, but distinguished from that species by its much greater size and by the narrowness and browner colour of the bordering of the tail-feathers.

TROCHILUS (—?) *STROPHIANUS*. *Troch. maculo viridi in frontem splendenti; lato maculo semilunari, inter violaceam gulam et abdomen viridem, albo; rectricibus nigris.*

On the forehead, immediately above the bill, a luminous spot of green; crown of the head, all the upper surface and abdomen dull green; throat rich bluish violet, separated from the green of the abdomen by a broad lunate gorget of white; all the tail-feathers black; wings blackish brown, with purple reflections; under tail-coverts white; bill black.

Total length, $4\frac{1}{2}$ inches; bill, $\frac{3}{4}$; wing, $2\frac{1}{2}$; tail, $1\frac{3}{4}$.

Hab. Precise locality unknown.

Nearly allied to but smaller than the *Ornismya Clarisse* and *Parzudaki*.

June 23.—Harpur Gamble, Esq., M.D., in the Chair.

Professor Owen read a Memoir (Part II.) on the *Dinornis*, descriptive of parts of the skeleton transmitted from New Zealand since the reading of Part I. (*Annals*, vol. xiv. p. 59.)

The bones referable to species defined in that communication were first described. Among these were the cranial portion of the

skull of *Dinornis struthoides* and a corresponding portion of the skull of *Dinornis dromioides*, which in general form more resembled that part of the skull of the Dodo than of any existing bird; but they are remarkable for the great breadth of a low occipital region, which slopes from below upwards and forwards; the almost flat parietal region is continued directly forwards into the broad sloping frontal region; the temporal fossæ are remarkably wide and deep; the orbits small; the olfactory chamber expanded posteriorly, but not to so great an extent as in the Apteryx; the plane of the foramen magnum is vertical. Many other characteristics in the cranial organization of the genus *Dinornis* were described, and the specific distinction of the two mutilated crania pointed out.

The tympanic bone of the *Dinornis giganteus* was described in detail and compared with the same bone in existing birds.

Different cervical and dorsal vertebrae, referable to the species *Din. giganteus*, *ingens*, *struthoides* and *crassus*, were described. These vertebrae were remarkably entire, and with some of the best-preserved bones of the extremities, described in a subsequent part of the Memoir, had been obtained from a turbary formation on the coast of the Middle Island, near Waikawaite.

One of the most interesting of the novel acquisitions from this locality was an almost entire sternum, referred by Prof. Owen to the *Din. giganteus*. It is a subquadrate, keel-less, shield-shaped bone, broader than long, with the posterior angles and the xiphoid process prolonged, as in the Apteryx, but without the anterior emargination. The coracoid depressions very small. This bone was minutely described and compared with the keel-less sternums of the existing Struthious birds; that of the Apteryx being demonstrated to be most like the sternum of *Dinornis*.

The following bones of the extremities, imperfectly or not at all known in 1843, were next described:—

The entire femur of *Dinornis giganteus*. Entire tibiæ and tarso-metatarsi of *Din. giganteus*, indicating a robust variety of this stupendous bird to have existed in the Middle Island.

The tarso-metatarsus of *Dinornis ingens* from the North Island, distinguished by a rough depression indicative of a fourth or back-toe, and consequently a genus (*Palapteryx*) distinct from *Dinornis*.

Femora, tibiæ and tarso-metatarsi of a *Dinornis* of the height of the *Din. ingens*, but of more robust proportions, from the Middle Island; with a feeble indication of a surface for a back-toe.

The tibiæ and tarso-metatarsi of *Dinornis (Palapteryx) dromioides* from the North Island, confirming by their long and slender proportions the conjecture hazarded in the author's former memoir (Zool. Trans. vol. iii. pp. 252, 264). The tarso-metatarsus also shows the rough elliptical surface for the attachment of the back-toe, indicating the *Din. dromioides* to belong to the same generic or subgeneric section as *Din. ingens* from the North Island.

Femora, tibiæ and tarso-metatarsi, from the Middle Island, were next exhibited and described, which establish a new species, for which Prof. Owen proposed the name of *Din. casuarinus*: a small

and feeble depression, five lines by three lines, indicates that this species had a back-toe in the corresponding position with that in the Apteryx, but more rudimental.

A very remarkable femur and tarso-metatarsal bone, also from the Middle Island, were exhibited, belonging to an additional tri-dactyle species, to which the name of *Dinornis crassus* was given. Of this species the author remarks: "With a stature nearly equal to that of the Ostrich, the femur and tarso-metatarsus present double the thickness in proportion to their length. It must have been the strongest and most robust of birds, and the best representative of the pachydermal type in the feathered class."

The third new species is comparatively a small one, being intermediate in size between the *Dinornis didiformis* and the *Din. otidiformis*; it was founded on remains exclusively from the North Island, and was called by the author *Dinornis curtus*.

The paper (which was illustrated by numerous figures) concluded by some general comparisons and remarks on the geographical distribution of the different species of *Dinornis*.

MISCELLANEOUS.

Note on the Organogeny of Irregular Corollas. By M. BARNEOUD.

In the *Orchidaceæ*, if a flower of *Orchis galeata* be examined in the very earliest condition, it will be found to consist of a simple cupula of very transparent tissue, on the border of which three round equal teeth soon become visible: these constitute the exterior verticil, which is formed exactly in the same manner as a true monophyllous calyx. In a short time a second cupula is seen to originate in the interior of the first, and its substance quickly becomes blended with that of the latter, except that its border exhibits three small prominences, perfectly equal and alternating with the teeth of the exterior verticil. Thus the author considers that organogeny clearly demonstrates in the *Orchidaceæ*, as in most other monocotyledonous families, analogues of the calyx and corolla of dicotyledons. The three nascent segments of the interior verticil of *Orchis galeata* are quite similar in the early condition, and it is not until a subsequent period that one becomes evidently broader and more fully developed than the two others; this it is which becomes the *labellum*. *Orchis Morio*, *Ophrys aranifera*, and two exotic genera, a *Maxillaria* and an *Oncidium*, presented exactly identical conditions.

In the *Labiata*, the corolla of *Lamium garganicum* when it first becomes visible is represented by a little cupula scarcely hollowed out at all, bordered by five teeth which are very short and at this time alone, quite equal, for two of them speedily cohere and become blended together to form a large, round and very convex lamella, which subsequently becomes the helmet of the *Lamium*. Of the three remaining teeth, the central one also becomes much larger than the others, which are always small and atrophied. The evolution of the didynamous stamens exposes the singular fact, that the

larger two originate rather before the other two, which they exceed in length at every period of their development. Among other *Labiata*, *Ajuga reptans*, *Scutellaria columnæ* and *commutata*, present us with the same phenomena. In *Phlomis fruticosa* the helmet is formed of two segments of the corolla, as in *Lamium*.

In the *Scrophulariaceæ* the segments of the nascent corolla are also equal, but only at their origin. The inequality always manifests itself very soon, and earlier in proportion to the subsequent irregularity of the corolla (*Antirrhinum majus*, *Linaria cymbalaria*, *Penstemon Scoulteri*, *Collinsia bicolor*, *Scrophularia verna*). In the genera which possess a fifth, supplemental stamen, this is formed at the same time as the two smaller and in the spot which remains vacant in the *Labiata*. The symmetry is then perfect.

In the *Aristolochiaceæ* (*Aristolochia Clematitis* and *Pistolochia*), the simple perigone composing the flower is, at its origin, a kind of tube, very short, at first with an equal and as it were truncated border; but this state persists but a very short time. One side of the mouth of the tube becomes much developed, so as to form the well-known limb of the *Aristolochias*, while the other undergoes but slight expansion.

In the *Verbenaceæ* (*Verbena urticifolia*) and in the *Dipsaceæ* (*Scabiosa ucranica* and *atropurpurea*), the irregular corolla follows the same law of development.

The petals of the *Leguminosæ* are equal and alike at the origin of the flower; but a difference of form and size very soon becomes evident (*Cytisus nigricans* and *laburnum*, *Ulex europæus*, *Erythrina cristagalli*).

The case is the same in the *Polygalaceæ* (*Polygala austriaca* and *chamæburnus*). From all these circumstances we may conclude that the irregularity of the corolla, at least in the families cited in this note, is a condition arising after the first appearance of the flower, and is a consequence of an inequality of development among the different parts which compose the floral envelope.—*Comptes Rendus*, June 8, 1846.—A. H.

EXTRAORDINARY FLIGHT OF BUTTERFLIES.

To Richard Taylor, Esq.

Philosophical Hall, Leeds, July 20, 1846.

DEAR SIR,—As there is an account of a large flight of *Butterflies*, in one of the Canterbury papers, which passed over from France to England during the present month, without any precise statement as to the *species*, it would be very desirable if some reader of the 'Annals' could furnish that piece of information, so that a more complete record of the circumstance might be preserved. Should the above account have escaped your notice, I venture to send a copy of it, taken from the Leeds Mercury of July 18th:—

"*Extraordinary Flight of Butterflies*.—One of the largest flights of *Butterflies* ever seen in this country crossed the Channel from France to England on Sunday last. Such was the density and extent of the

cloud formed by the living mass, that it completely obscured the sun from people on board our continental steamers on their passage for many hundreds of yards, while the insects strewed the decks in all directions. The flight reached England about twelve o'clock at noon and dispersed themselves inland and along shore, darkening the air as they went. During the sea passage of the butterflies the weather was calm and sunny, with scarce a puff of wind stirring, but an hour or so after they reached *terra firma* it came on to blow great guns from the S.W., the direction whence the insects came."—*Canterbury Journal*.

If the time occupied in the passage over could be ascertained it would also be interesting—at all events the hour at which they were observed by the people on board the steamer and the distance from land could be ascertained, and that would go some way towards the rate at which they travelled, the period of their arrival being stated.

I am, dear Sir, yours very truly,

HENRY DENNY, A.L.S.

Do Plants placed in a Solution containing several Substances, absorb certain Substances in preference to others? By M. BOUCHARDAT.

Theodore de Saussure, who made so many beautiful experiments on vegetation, has answered the question which I have here proposed in the affirmative; but the results which he obtained do not appear to me sufficiently free from all chances of error to render it unnecessary to return to this subject. The way in which the experiments of Theodore de Saussure were made may be stated in a few words. He dissolved in 793 cubic centimetres of water two or three different salts, each weighing 637 milligrammes; he analysed the residue of the solution when it was reduced one-half by absorption by the roots of the plants. The quantity of salts contained in the residuc, *minus* that which the liquid contained before the introduction of the plants, indicated the quantity of salts absorbed. Theodore de Saussure saw that with several salts this quantity was very unequal; thus, to cite only one example, in a mixed solution of nitrate of lime and muriate of ammonia, a *Polygonum* absorbed two of nitrate of lime and fifteen of muriate of ammonia.

The differences were particularly great with the soluble salts of lime; their absorption appears infinitely less easy than that of several other salts; but the following experiment throws much doubt on the conclusion to be drawn from the facts cited by Theodore de Saussure.

In a solution in distilled water containing one gramme of sulphate of soda and one gramme of chloride of sodium to the litre, I planted a *Polygonum persicaria*, and when half the solution was absorbed, I examined the residuc, and found in it, besides the oxalate of ammonia, a notable quantity of lime, which did not exist in it previously, and which had been furnished by the vegetable.

This then is one capital cause of error which escaped Theodore de Saussure.

When a vegetable is immersed in an aqueous solution, there is

not a pure and simple absorption of the solution, but a double current is formed. As the salt of the solution passes into the plant, so the salts of the plant arrive in the solution. This is the principle which M. Dutrochet has so well developed in his excellent investigations on Eudosmosis.

There is a strong and a weak current, but always a double current, and not a pure and simple absorption. This cause of error is very important, for Theodore de Saussure operated only upon 637 milligrammes, diminished by the fact of the absorption alone, and he did not at all attempt, in his analyses, as may be seen at page 255 of his '*Recherches sur la Végétation*,' to find any other principles than those which he wished to estimate; moreover he has not indicated the weight of the plants he employed.

To avoid, as far as possible, the chances of error caused by the excretions of the roots, I thought that plants should be chosen which, living a considerable time in water, might, by a very long vegetation, be brought into such a condition as no longer to yield any fixed salt to the distilled water, and which would yet possess a marked power of absorption. *Mentha aquatica* seemed, from numerous previous experiments, to fulfil these conditions much better than the *Polygonum persicaria* and *Bidens cannabina*, selected by Theodore de Saussure. The following is the manner in which my experiments were made. Branches of mint, furnished with numerous adventitious roots, which had lived in pure water for more than six months, were placed in flasks containing distilled water which was renewed every five days. When the reagents did not indicate any foreign salt in this water, I made with these plants precisely the same experiments as Theodore de Saussure had done, and I then found, that a vegetable freely immersed by its roots in a very dilute solution of several salts, having no chemical action on its tissues, absorbs all the substances contained in that solution in equal proportions.

The differences which I have pointed out in my memoir, in the absorption of substances contained in one and the same solution, are too slight for us to admit, with Theodore de Saussure, that the roots select certain salts in a solution in preference to others: that he arrived at different conclusions, results from his having operated only on a few centigrammes of salts in solution, and having omitted to take into account the excretion which is continually going on from the roots simultaneously with the absorption.

The differences observed in analysing the residue of the solutions depend on certain salts being fixed in the plants, either from their concurring in the development of special organs, as the phosphates to that of the grain of the grasses, or from their forming insoluble combinations with some principles of the plant; whilst other substances, which are not subjected to either of these two conditions, are excreted freely by the roots: thus it appears to me that the inverse of Theodore de Saussure's conclusion is correct.

Roots which are immersed in water absorb indifferently all the substances dissolved in this liquid; but the excretions, on the contrary, may present great differences.—*Comptes Rendus*, June 8.

ON A SPECIES OF HIPPOPOTAMUS FROM SIERRA LEONE.

To Richard Taylor, Esq.

British Museum, 15th July, 1846.

MY DEAR SIR,—Dr. Morton described a short time ago a second species of *Hippopotamus* from Liberia, which proves to be most distinct, and is not larger than a calf; by the inclosed note sent me by my friend Colonel Thompson (who, during his governorship of Sierra Leone, paid much attention to natural history, and amongst other things prepared the skeleton of the adult Chimpanzee described by Mr. Owen), it appears that a species about the same size is found in Sierra Leone; at any rate the Sierra Leone animal would be a most interesting addition to our collections. The Wolverine is certainly the Rattel, and the Lemur the *Galago*.

Yours very truly,

J. E. GRAY.

To J. E. Gray, Esq.

Blackheath, 12th July, 1846.

MY DEAR SIR,—In the year 1808 or 1809, being then Governor of Sierra Leone, I heard of the killing of an animal, which, my impression at the time and ever since was, must have been of the *Hippopotamus* or *Tapir* class. It was killed by the Maroons in a stream like a small trout-stream, called the Hog-brook (from the presence of wild hogs), five or six miles inland from Freetown, and now I believe the site of *Wilberforce*.

I was shown the place to which it retreated and in which it was killed; being precisely such a deep hole as is found every now and then in a trout-stream where the water circles round. The place was shown me by Capt. Charles Schaw of the Maroons, a man of excellent character and credit, in whom I should place the most implicit reliance, and who was present at the hunt. He said it was of the size of a small cow (cows are very small at Sierra Leone, and therefore this may be set down as marking the size of one of the smallest cows of the Highland breed); that its skin had only a hair on it here and there, and (I think he added) the skin was *black*; and that it had "a mouth full of ivory," by which I clearly understood him to mean that it had tusks or projecting teeth.

On recollection I think it was from Mr. Ludlam, my predecessor, that I heard of the killing of the animal, and was afterwards taken to the spot in consequence of my inquiries.

Of curious animals of which I have myself had specimens at Sierra Leone, I will mention the Chimpanzee; *Touraco* (called by the colonists the Mountain Peacock), *Cerastes* (of which I have seen three specimens); an animal which I suspected to be of the class of the Wolverine (confirmed by the report of the natives of the country that it threw itself on animals from a tree), remarkable for being divided into black and white by a horizontal line, so that it looked like a creature that had been in the mud (the specimens I saw were about a foot high, but the natives stated that it grew to the size of a goat); and a very beautiful small animal which I suspect to be of

the order of the Active Lemur, resembling in the main a small squirrel, but of a lighter hazel, with very large eyes, and the fore feet very much like the human hand, except that there was a protuberance on the ball of each finger and toe; also the Thumbless Monkey.

Yours very sincerely,

T. PERRONET THOMPSON.

On the Nectariferous Glands of Leaves, and on some Saccharine Secretions. By M. UNGER.

M. Unger was led to this investigation by his observing on an acacia, in the spring of 1843, that whilst the plant was in flower, a saccharine and transparent liquid flowed from its phyllodia in numerous drops. In 1844 he observed a similar phenomenon on other species of the same genus, but not upon all.

The attention of this German naturalist was particularly directed to the species in which the secretion is the most abundant, the *Acacia longifolia*.

At the base of the lamina of the leaf or of the phyllode of this plant, and at its upper margin, a small impression is remarked in the form of a point, which is the orifice of the excretory canal of a cavity existing in the substance of the organ. This cavity is not hollowed in the ordinary parenchyma, but it is surrounded entirely by peculiar cells with small and thin walls, the whole constituting a sort of glandular apparatus, in the form of a haricot bean, voluminous, and attaining as much as a third of the volume of the phyllode. It is surrounded by several vascular bundles, and has direct relations with four of them.

The cells which form the gland contain no solid matter; but those which surround this apparatus contain granules of starch which become more numerous and larger in proportion to their distance. The liquid which fills them is turbid, which shows its state of concentration. On examining it with the aid of some re-agents, M. Unger was led to admit that it contains, besides the sugar, a second substance, gum or vegetable mucilage. This organization recalls what Schlechtendal has described on the leaves of the *Viburnum Tinus* and the *Clerodendron fragrans*.

The author deduces the following results from his observations:—

1. The nectariferous glands of the leaves possess, with respect to their essential structure, a great analogy with one another.

2. The production of the sugar is effected in all in the same manner.

In the interior of the glands of the *Acacia longifolia*, and toward their deferent canal, M. Unger has traced the existence of several small brown bodies, in the form of articulated tubes, which he thinks may be regarded with some reason as belonging to the *Cladosporium fumago*, Linck, a polymorphous fungus which was abundant in the ground where this acacia was found.

To M. Unger's memoir is added an appendix, the object of which is certain abnormal saccharine secretions. Among these secretions,

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some occur forming a sort of varnish on the upper surface of the leaves of different trees, and cannot be attributed to Aphides. Others, observed on the fir, proceeded from the axes of the branches, which were attributable, according to all appearance, to the irritation of an insect, which was constantly seen at these places, and to which M. Kollar has given the name of *Lecanium abietis*.—*Flora*, No. 41.

OBITUARY—MR. THOMAS EDMONDSTON.

Science has lately had to deplore the loss of a promising and enthusiastic votary in Mr. Thomas Edmondston, the young and talented naturalist who accompanied Captain Kellett to the west coast of America in H.M. Surveying Ship Herald. During the month of April, shortly after reaching the Galapagos Islands, Mr. Edmondston was killed by the accidental discharge of a loaded musket. He was the son of Dr. Edmondston of Unst in Shetland, himself a naturalist of reputation, and the author of some excellent papers in the 'Memoirs of the Wernerian Society.' Mr. T. Edmondston displayed his talents at a very early age, and had acquired a remarkable knowledge of all branches of natural history when a mere boy. His age was only twenty-three when he died. He had published many interesting papers on zoological and botanical subjects before leaving England, and was the author of an excellent little 'Flora of Shetland.' He had just been appointed Lecturer on Natural History in the Andersonian Institution in Glasgow, when he was selected for the honourable post of Naturalist to the 'Herald.' During the short time he had been engaged in his duties before his death, he led his friends to form great expectations of the results of his researches—doomed, alas! to be sadly disappointed before he had fairly entered upon the unexplored field to which he had looked forward with ardent anticipations. The following letters written to a friend in England during the early part of his voyage, may serve as melancholy records of the zeal and observing powers of our lamented friend:—

H.M. Ship Herald, off Cape Horn, 20th Oct. 1845.

I sit down to give you a brief account of my motions since I wrote you from Rio de Janeiro, and by way of husbanding my time in port, I shall commence this now. We reached the Falkland Islands on the 19th September, after a rather stormy but not otherwise remarkable voyage from Rio; we left again on the 29th. We were very unfortunate in being at these islands while the gales accompanying [their] vernal equinox were raging in all their fury: such villanous weather I never saw—constant gales of wind accompanied by snow and very cold. Doing anything in marine zoology was out of the question, for though both Captain Kellett and myself were extremely anxious to spend as much time in dredging as possible, there was never an hour during the whole time we staid there sufficiently moderate to allow of dredging. Captain Kellett, with his usual kindness and zeal for the interests of science, made me welcome to a manned cutter whenever the weather should allow of my using it; it was however never sufficiently moderate in the wind to render

dredging safe, or even practicable. I regretted this adverse state of things extremely, as you may suppose, and the more so since I have not the least doubt that the bays, the shores of which are lined with such a prodigious growth of Algæ (chiefly *Macrocystis*) could not fail to yield numerous very interesting animals, more particularly soft species, such as *Holothuriæ* and Nudibranchous Mollusks. Judging from the species found along the beaches the shells cannot be very numerous, though this criterion is somewhat fallacious, as drift specimens are liable to get entangled among the dense barrier of sea-weed, and thus prevented from landing. Three or four *Mytili* and *Modiolæ*, a large *Cytherea*, something like the *C. petechialis* of our cabinets, are common; the *Mytili* especially swarm. I cannot distinguish the common species from our *M. edulis*, except in being larger. A small *Modiola* like *M. discrepans* is not rare. I procured only one *Chiton*, but large patelliform shells are the characteristic species; the *Patellæ* and *Fissurellæ* being very large and numerous, though not in great variety as regards species. Owing to the storms and snow rendering the country almost impassable on horseback, I was never able to make any long excursions; this was the less to be regretted, as the plants were none of them in flower, the season of the year answering to our March, and everything being wrapped in winter. I sent home *via* Rio a Ward's case filled with the Tussac grass for Sir William Hooker. I occupied myself principally with the birds during our stay, as although, owing to the inclemency of the weather, collecting of any kind was rather uphill work, these were more easily procured and in greater perfection than any other. I got many species, especially of water birds, and some fine species. Three wild geese, *Anas leucoptera*, *antarctica* and *brachyptera* (the latter unable to fly), are very common; three gulls, a widgeon, a teal, a white-bellied shag, two penguins (the *Aptenodytes demersa* and the king penguin), the *Procellaria gigantea*, and a small grebe very like our *Podiceps auritus*, are among the most abundant. Of the Raptorial birds, the *Polyborus novæ zealandiæ*, a very curious bird, which to a structure precisely connecting the two genera *Aquila* and *Buteo*, adds the most perfectly vulturine feeding propensities, haunting the slaughter-houses and wherever carrion or offal is to be procured, and being the general scavenger of the settlement, is very common and familiar. The turkey buzzard (*Cathartes aura*) is abundant, and there are two or three other hawks and an owl or two. Of the Conirostral birds I saw only one species, which represents our sparrow; it is a beautiful green and orange bird, and seems intermediate between the genera *Passer* and *Linota*. A fine *Cassicus* with a bright red throat and breast was also procured, but it is far from plentiful. The most common cantatorial species is a small grayish blue *Sylvia* with a black head. The shore birds are numerous; the most interesting is a *Chionis*, I suppose identical with the New Zealand species. This curious bird in habits and form of body is completely an oyster-catcher; it is pure white with lead-coloured legs and feet and a very strong bill, the upper mandible quite like that of a gallina-

ceous bird, but the lower mandible still stronger; the lower fourth of the bill is enveloped in a curious horny sheath, quite unlike any other bird I am acquainted with. A curious naked caruncled skin surrounds the eye, and similar caruncles are situated under and before the eye. I have no work containing any detailed description of the only species known of this genus, except Cuvier's short notice, but so far as it goes that agrees with my bird. Darwin does not notice it as a native of the Falklands, and had he seen it, it is not likely he would have omitted such a remarkably anomalous bird. I know not if it was brought home by the 'Erebus' and 'Terror'; the bird is not unfrequent in flocks on the sea-shore. I dissected several specimens; all had their large crops filled with a small white nereidous annelide: the strong bill would seem to point to a still more truly conchivorous diet than its near allies the oyster-catchers, yet this does not seem to be the fact. The *Chionis* appears to form a Rasorial type in the Grallatorial circle.

Two true oyster-catchers are not uncommon, one black and white very like our British species, and the other brown and larger. A dottrel very similar to our ring dottrel and a small gray tringa are common, and on the moors a large snipe is frequent, and furnished some of our sportsmen with very good shooting.

As regards the geology I have little to communicate: all the district which I visited is composed of a dull gray quartz rock more or less distinctly stratified, and frequently, when good sections are to be seen, which are by no means common, exhibiting very remarkable flexures and contortions, similar to those which are so common in the Northern Islands in gneiss and mica slate. There is also sandstone in the islands, supposed to belong to the Silurian period, but none within a day's journey of us, and I consequently did not see it. Darwin mentions the remarkable "streams of stones" found in these islands. I shall give you the results of a careful examination of several of them.

The "stream" consists of a mass of angular blocks of quartz, varying in size from a man's head up to that of a small house, but averaging about four or five cubic feet; they generally occupy a flat valley, and the inclination is mostly very little, in none which I saw exceeding 10° or 12° ; they vary in extent, but are generally one to three miles long. For the most part the stones forming the stream are piled one on the top of the other to a considerable depth in the soil, as no vegetation is to be seen in the crevices; the stones are covered by lichens, and show no marks of attrition by water, being on the contrary always somewhat angular. I cannot venture to propose any theory regarding these curious appearances. Mr. Darwin, whose observations are always as accurate as his conclusions are cautious and rational, suggests (though apparently rather as a "simile" than a theory) that the effect is similar to what would happen if a stream of lava had been suddenly rent into fragments by some violent internal convulsion; and the simile is very just, though we cannot for a moment suppose that quartz rock has flowed over a

valley like lava : perhaps a very sudden and violent flood might produce the effect, though from the appearance of the fragments it cannot have been produced by long-continued fluvial action.

The aspect of the Falkland Islands during an equinoctial gale and snow is anything but prepossessing : the hills are low and peat is universal. A few stunted shrubs and withered grasses cover the moor, and that is all. If you can imagine the Shetlands or Hebrides in the end of February or beginning of March, substitute *Myrtus nummularia* and one or two other Antarctic shrubs for our *Erica* and *Calluna*, you have a very good idea of the Falklands. In summer doubtless very interesting plants may be had, but you will get as many specimens on the Brac of Badenoch at Christmas as in the Falklands while we were there.

Valparaiso, 3rd December 1845.

We arrived here on the 16th ult., and I immediately started for the interior. I could only get a week's leave, but in that time botanized a good part of the hill skirting the Cordillera de San Carlos and part of the latter itself, but the hills of much elevation are extremely barren.

Since I came back I have been gathering plants and shells ; the littoral shells are—*Chitons*, of course in profusion ; *Patella*, *Fissurella*, *Trochus*, *Monoceros*, *Turbo* (true, large, round), *Marginella*.

H.M. Ship Herald, Païta, Peru, 28th December 1845.

First wishing you most sincerely a merry Christmas and a happy new year, I shall, though much hurried, give you a brief sketch of my proceedings in marine zoology since we left Valparaiso, from which place I wrote you fully.

We put in for a couple of days into a small bay named Papudo, about thirty miles N. of Valparaiso ; here I made some very interesting additions to my collection of plants, some of which will I believe turn out to be new.

I dredged all over this bay ; the greater part of the bottom is sandy, the sand is loose and micaceous, and as the bay is very open there are few or no animals in it. A very few minute univalves and numerous small Crustacea—numerous in individuals I mean, but all one species,—were all that a very careful search afforded. In a few places where the bottom was gravelly the shells were more numerous, but the same species as I have described from Valparaiso : *Turritellæ* equally common from four to fifteen fathoms ; but there is no such distinction between the banks of *living* and *dead* shells which struck me as being so remarkable at Valparaiso, dead specimens containing *Paguri* and those with the animal coming up indiscriminately. Along with these there were a few univalves and Crustacea, and at fifteen fathoms three specimens of a hyaline *Terebratula*, *alive* ; it is about three-quarters of an inch across, and does not seem described in the last edition of Lamarck : the littoral shells were not different from those at Valparaiso. From Papudo we steered direct to Callao, where we remained five days. I spent two of these at Lima, where

I experienced much attention from Mr. Maclean, a merchant there, well-known for his attachment to science, and a very good botanist.

I could not, owing to the disgraceful state of the country, make any long excursions here, even had our time allowed; robberies even between the two cities of Lima and Callao, distant only seven miles, are common, and mostly performed by the soldiery, and travelling in the country is well nigh impracticable.

I spent most of my time in examining the marine productions. I got a number of good Algæ and a variety of fish, besides shells. The littoral rocks, from the variety of animals found on them, present a very gratifying picture to the lover of marine zoology: an *Echinus* with black spines, three or four species of large and curious *Actiniae*, a *Uraster (rubens?)*, a thirty-rayed *Solaster*, several crabs, three *Chitons* (different from the Valparaiso species), *Concholepas*, *Balanus Psittacus* and another species, *Littorinæ*, *Trochi*, large *Fissurellæ*, &c. are crowded on every rock, forming, from their varied shapes and colours, a not less beautiful than instructive sight: some of the species are the same with the Chilian, but many different.

The island of San Lorenzo interested me much; it is composed of thin strata of a blackish volcanic schist; the angle is low, and it is everywhere split into small cubical masses in a direction at right angles to the stratification. With the exception of one or two patches of a *Schevinia* and two or three other succulent plants near the sea, there is not a particle of vegetation, the island being covered by brown drifting sand, among which are mixed innumerable shells and other marine productions in various degrees of preservation, some preserving even their colour, others fragmentary and decayed: the greatest depth to which I could penetrate presented the same loose sand, and equally loaded with organic remains. All the species I found alive in the bay, *Concholepas*, *Pecten*, *Crepidula*, were the most plentiful, but there were many others; many had *Balani* attached.

What struck me most was the excellent preservation of some of the specimens; the *Pecten* (very like our *P. opercularis*) in many instances preserved its fine red colour, while at other times the shells were as much decayed as if they had come out of the London clay. I tried, by digging down as far as I could, to ascertain if the lower layers were in better preservation than the upper, but I found the same mixture as on the top. In some places great abundance of dead shells of a small striped *Bulinus* were plentiful. I found two live ones only after a long search; they had their mouths closed by a mucous epiphragm like our snails in winter. The loose sand containing these semifossils is continually being drifted by the wind.

The bay of Callao swarms with fish, and consequently with large pelicans and multitudes of other piscivorous birds. Four species of sharks and enormous sting-rays (*Trygon*) are plentiful.

We are just now going into the bay of Paita, where we only stay for meridian distances, and thence go to Guayaquil or Puna for the same purpose; we then start for the Galapagos and then to Panama; we shall most likely arrive at the latter place some time in February.

PROPOSED WORK ON APHIDES.

The most complete work hitherto published on *Aphides* is that of Kaltenbach. He has described 156 species, which he has distributed into the following genera:—1. *Aphis*, Linn.; 2. *Lachnus*, Illiger; 3. *Schizoneura*, Hartig; 4. *Tetraneura*, Heyden; 5. *Pemphigus*, Hartig; 6. *Vacuna*, Heyden; 7. *Phylloxera*, Fonscolombe; 8. *Rhizobius*, Burmeister; 9. *Forda*, Heyden; 10. *Trama*, Heyden; 11. *Paracletus*, Heyden. I take this opportunity to state that I shall be glad of information respecting *Aphides* and the plants which they infest, as I am engaged in describing the British species of that tribe of insects.—FRANCIS WALKER, 49 Bedford Square, July 1846.

METEOROLOGICAL OBSERVATIONS FOR JUNE 1846.

Chiswick.—June 1, 2. Slight haze: cloudless. 3. Slight haze: very dry air: clear and fine. 4—6. Hot and dry. 7. Sultry. 8, 9. Cloudy and fine. 10. Overcast. 11, 12. Very fine. 13, 14. Hot and dry. 15. Cloudless. 16—18. Hot and dry, with slight haze. 19. Foggy: excessively hot: clear at night. 20. Hot and sultry. 21. Uniformly overcast: fine. 22. Sultry: excessively hot: rain: at night thunder, lightning, and heavy rain. 23, 24. Densely clouded. 25. Fine. 26. Overcast: heavy showers. 27, 28. Cloudy and fine. 29. Fine, with clouds: windy: clear at night. 30. Cloudy and fine: overcast.

Mean temperature of the month 66°·63

Mean temperature of June 1845 62·14

Average mean temperature of June for the last twenty years 60·88

Average amount of rain in June 1·88 inch.

Boston.—June 1. Cloudy. 2. Fine: half-past 11 o'clock A.M. thermometer 75°: 2 o'clock P.M. 78°. 3. Fine: 3 o'clock P.M. thermometer 80°. 4. Fine. 5. Cloudy. 6. Fine: quarter-past 2 o'clock P.M. thermometer 82°. 7. Fine. 8. Cloudy: lightning A.M. 9, 10. Cloudy. 11—17. Fine. 18. Fine: quarter-past 11 o'clock A.M. thermometer 80°. 19. Fine. 20. Cloudy. 21. Fine. 22. Cloudy: rain P.M., with thunder and lightning. 23. Rain: rain early A.M.: rain P.M. 24. Fine. 25. Fine: rain and hail, with thunder and lightning P.M. 26—28. Cloudy. 29, 30. Fine.—The past month has been considerably warmer than any month of my observations.

Sandwich Manse, Orkney.—June 1—3. Fine. 4. Fine: bright: fine. 5. Fine: bright: cloudy. 6. Damp. 7. Damp: cloudy. 8. Cloudy. 9. Damp: fog: cloudy. 10. Cloudy: rain. 11. Bright: rain. 12, 13. Bright: clear. 14, 15. Bright: cloudy. 16. Bright: clear. 17, 18. Fine. 19. Thunder and hail*: cloudy. 20. Clear: fine. 21. Clear. 22. Cloudy: fog. 23. Rain and thunder: thunder and rain. 24. Drizzle: thunder and drops. 25, 26. Clear. 27. Rain: clear. 28. Bright: cloudy. 29. Bright: drops. 30. Bright: showers.

Applegarth Manse, Dumfriesshire.—June 1—6. Very fine. 7. Very fine: thunder. 8. Fine soft rain. 9, 10. Slight shower. 11. Fair, but cloudy. 12—16. Fair and fine. 17. Fair and fine: warm. 18. Fair and fine: thunder. 19. Slight drizzle: thunder. 20. Dry and withering. 21. Very warm and withering. 22. Very warm: showers: thunder and hail. 23. Very heavy rain. 24, 25. Showers: fair P.M. 26—29. Heavy rains. 30. Very heavy rain.

Mean temperature of the month 63°·2

Mean temperature of June 1845 56·5

Mean temperature of June for twenty-three years 55·7

Mean rain in June for eighteen years 3 inches.

* The most severe thunder-storm ever remembered: one man was killed, others knocked down, and the lightning struck various places. It was at its height between six or seven o'clock A.M.

Meteorological Observations made by Mr. Thompson at the Garden of the Horticultural Society at CHISWICK, near London; by Mr. Veall, at BOATON; by the Rev. W. Dunbar, at Applegarth Manse, DUMFRIES-SHIRE; and by the Rev. C. Clouston, at Sandwick Manse, ORKNEY.

Days of Month.	Barometer.				Thermometer.				Wind.				Rain.				
	Chiswick.		Boston 84 a.m.	Dunfriess-shire.		Orkney, Sandwick.		Chiswick.	Boston 84 a.m.	Max.	Min.	Dunfriess-shire.	Orkney, Sandwick.	Chiswick. 1 p.m.	Boston.	Dunfriess-shire.	Orkney, Sandwick.
	Max.	Min.		9 a.m.	2 p.m.	9 a.m.	84 p.m.										
1846. June.																	
1.	30.187	30.153	29.66	30.10	30.11	30.14	30.13	79	46	62	76	45	56	54	e.	calm	sw.
2.	30.210	30.188	29.71	30.10	30.11	30.12	30.13	82	43	70	77	50	68	61	e.	calm	sw.
3.	30.216	30.177	29.65	30.16	30.12	30.13	30.13	85	45	73	80	51	60	59	e.	calm	sw.
4.	30.178	30.159	29.60	30.10	30.09	30.14	30.09	83	49	74	80	55	68	57	e.	calm	sw.
5.	30.143	30.115	29.56	30.08	30.04	30.03	30.10	84	49	73	80	51	75	56	e.	calm	sw.
6.	30.084	30.035	29.48	30.00	29.98	30.04	30.06	89	53	76	77	53	56	56	se.	calm	sw.
7.	29.978	29.883	29.33	29.95	29.93	30.07	30.00	90	56	78	80	56	55	53	sw.	calm	sw.
8.	29.871	29.806	29.29	29.80	29.71	29.91	29.80	79	50	63.5	65	56	55	53	sw.	calm	sw.
9.	29.835	29.772	29.19	29.67	29.67	29.68	29.60	77	51	64	69	52	56	56	sw.	calm	sw.
10.	29.995	29.912	29.34	29.70	29.68	29.65	29.64	77	56	67	67	57	60	53	sw.	calm	sw.
11.	30.195	30.149	29.53	29.97	29.93	29.83	29.90	81	53	72	66	53	54	53	w.	calm	sw.
12.	30.222	30.126	29.64	30.09	30.05	30.02	29.90	85	50	70	70	47	60	56	w.	calm	sw.
13.	30.096	30.094	29.55	30.04	30.04	29.95	30.01	86	52	73	70	56	57	55	ne.	calm	sw.
14.	30.106	30.074	29.47	30.07	30.04	30.07	30.07	82	50	77	75	55	56	52	e.	calm	sw.
15.	30.243	30.155	29.52	30.12	30.18	30.10	30.20	87	56	72	75	52	58	54	e.	calm	sw.
16.	30.320	30.289	29.64	30.25	30.25	30.26	30.29	87	50	77	79	50	56	54	e.	calm	sw.
17.	30.314	30.243	29.65	30.24	30.20	30.23	30.23	88	53	76	83	51	69	61	e.	calm	sw.
18.	30.210	30.145	29.59	30.16	30.09	30.21	30.12	88	54	76	83	58	70	62	e.	calm	sw.
19.	30.106	30.054	29.45	30.04	30.04	30.03	30.22	93	53	75	82	59	63	50	se.	calm	sw.
20.	30.181	30.087	29.52	30.18	30.22	30.32	30.30	87	62	68	69	57	54	49	e.	calm	sw.
21.	30.190	30.061	29.65	30.16	30.02	30.30	30.05	81	56	68	77	48	57	40	e.	calm	sw.
22.	29.957	29.619	29.40	29.88	29.70	29.96	29.78	93	59	66	81	56	58	56	se.	calm	sw.
23.	29.644	29.577	28.87	29.40	29.30	29.61	29.27	69	48	66	65	56	58	57	e.	calm	sw.
24.	29.517	29.401	28.95	29.22	29.30	29.12	29.29	67	48	64	61	48	54	53	w.	calm	sw.
25.	29.643	29.497	28.99	29.39	29.48	29.48	29.65	70	45	62	64	43	59	53	w.	calm	sw.
26.	29.681	29.647	29.22	29.48	29.41	29.69	29.67	67	54	63	59	44	58	54	sw.	calm	sw.
27.	29.797	29.629	29.12	29.44	29.54	29.57	29.62	73	50	65.5	67	51	55	54	sw.	calm	sw.
28.	29.850	29.806	29.31	29.61	29.43	29.62	29.62	74	58	66	66	55	60	55	sw.	calm	sw.
29.	29.814	29.786	29.31	29.47	29.10	29.46	29.34	76	57	68	64	55	62	56	sw.	calm	sw.
30.	29.978	29.888	29.27	29.49	29.65	29.33	29.36	75	48	67	62	54	62	55	sw.	calm	sw.
Mean.	30.025	29.955	29.41	29.878	29.853	29.876	29.891	81.46	51.80	69.7	72.3	52.6	59.75	54.86	0.80	1.08	4.85 1.60

THE ANNALS

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XVI.—*On the Growth of Cell-Membrane.* By HUGO v. MOHL*.

SINCE my doctrine, that cell-membrane increases in thickness by the deposition of successive layers of membrane deposited internally, has recently been contradicted on various sides, and, in opposition to it, the theory has been propounded, that the innermost cell-layer is the oldest and the most external the youngest, it is only natural that I should accept the challenge and enter the lists in defence of my views.

The first attack proceeded from Prof. Hartig of Brunswick : I endeavoured to set aside his objections to my view two years ago in the '*Botanische Zeitung*'†, without success so far as that author was concerned, as since that time a second treatise of his has appeared (*Das Leben der Pflanzenzelle*, 1844), which contains an answer to my objections and a more extended exposition of his theory. In reference to this second treatise however I must stand aloof, since my own observations agree so little with the researches there brought forward, that they afford me no point on which I can bring forward either opposition or confirmation ; in the following pages therefore I can take no notice of it. Otherwise it is connected with the observations on which the Utrecht professors, Harting‡, and Mulder§ rest their objections to my theory. As to the matters of fact in these researches I agree in many respects with my honourable adversaries, and there are I believe but few points which they have not taken into consideration, these however I must bring forward against the conclusions they have drawn.

According to my views, the primary membrane of the young cell is not perforated with orifices, and certainly no definite structure is visible in it||. On the other hand, Harting and

* From the '*Botanische Zeitung*,' May 15th—22nd, 1846. Translated by Arthur Hensley, F.L.S. &c.

† Jahrg. ii. 273. *Scientific Memoirs*, vol. iv. p. 91.

‡ *Mikrochemische onderzoekingen*, &c., vide *Bot. Zeit.* Jahrg. iv. p. 64.

§ *Versuch einer physiologischen Chemie.*

|| Vide my essay on the Structure of Vegetable Cell-Membrane in my *Vermischte Schriften*, p. 314.

Mulder now asserts that, almost universally, the yet unthickened membrane of young cells, when coloured blue by iodine and sulphuric acid, is perforated like a sieve by a great number of small pores, through which the light appears bright and uncoloured; the cells of the pith of *Asclepias syriaca*, *Lloydia carnosa*, *Ricinus communis*, of the bark of *Euphorbia caput medusæ*, of the wood of *Asclepias syriaca*, and *Clematis Vitalba*, are especially named in relation to this. Harting states that in the old medulla-cells with thickened walls of a great many dicotyledonous trees, *e. g.* *Æsculus Hippocastanum*, *Syringa vulgaris*, *Rosa canina*, *Sophora japonica*, there are, among the canals of the dots closed by a membrane, others which are quite open; and from his investigations he was led to the conclusion that these open pores are not the result of the absorption of the membrane closing the canal, but that they are the remains of the pores occurring in the young cell, which have not, like the others, become closed at a subsequent period.

I confess that to me this statement was unexpected. I had already, in cells I had coloured blue by iodine, often seen very bright dots, which appeared like real orifices, but I always believed that I saw a closing membrane; as I might have been deceived in my earlier observations, I submitted this point to a new investigation. In the first place, however, I must remark that I do not wholly approve of the mode of examination with iodine and sulphuric acid, chosen by Harting and Mulder; a deep blue colouring of the young cell-membrane is indeed obtained by this means, but in fact this deep colour is not advantageous, as will hereafter appear; moreover, when too strong an acid is employed a considerable expansion of the cell-membrane is readily caused, by which the dots may be closed; this indeed cannot give rise to a delusion in reference to the presence or absence of a closing membrane, but renders the making of a new preparation necessary. Both evils are avoided when no sulphuric acid is used, but the cell-wall coloured blue by the application of very concentrated tincture of iodine and subsequent moistening with water. In this way we are not exposed to the risk of producing a mechanical alteration of the cell-membrane, and there is the further advantage, that the preparation coloured by iodine may be allowed to dry again, by which means, as is known, the detection of very thin and transparent membrane is especially facilitated.

I treated in this way the medulla-cells of the young developing bud of *Sambucus nigra*, *Asclepias syriaca*, and of the apex of the stem of *Euphorbia caput medusæ*. The result of the microscopical examination of these does not at all agree with that offered by Harting and Mulder. It is certainly quite true that the

dots are so transparent, and appear so bright in the coloured cell-membranes, especially when they have acquired a deep indigo tint, that by an illusion they look like true openings. But to make the fact certain, we must ascertain accurately the performance of our microscope, and carefully select the suitable objective and covering glass of the proper thickness, regulate the proper illumination, in short, we must neglect no circumstance which may influence an important microscopical examination. Since the question, whether in these young cells actual openings are present or not, is one of the principal hinges on which the doctrine of the development of cell-membrane turns, I may be permitted to enter somewhat minutely into the qualifications of the microscope employed by me in these investigations. I am indeed, generally speaking, of opinion that the accuracy of a microscopical observation does not depend upon the fact of the microscope being a little better or worse, since experience in observation frequently counterbalances the inferiority of the instrument; but I consider that the present case is one of those in which an instrument of the most superior quality is necessary, and in which we cannot come at the truth without a microscope of great penetrating power. I commonly make use, in important investigations, of the three strongest of Plössl's objectives (N. 5-7), with an Amici's achromatic ocular, since this combination gives an image of surpassing sharpness and clearness with a magnifying power of about 300. Notwithstanding the superior performance* of this combination, I was not in a condition ever to detect any trace of a membrane closing the dot in the young medulla-cells of *Sambucus*, since the light shone through perfectly bright and clear, and apparently quite uncoloured as through a true opening. But when I used the strongest of Amici's objectives, which can only be employed with profit in few cases and to very delicate and transparent objects, and which with the same ocular gives a magnifying power of 500 diameters, every doubt was dissipated as to whether a membrane was stretched over the dot or not, since such a membrane was now distinctly to be perceived: it was indeed very transparent, but small granules, &c. were distinctly to be seen adhering to it. If this was not to be mistaken in the preparation which was lying in water, the result of the examination of dried preparations was yet more decisive, since no doubt was longer possible as to the presence of a closing membrane, and of the bright violet colouring of the same.

* For instance, the transverse stripes on the scales of the upper side of the wing of *Hipparchia Janira* are quite clearly seen with it; these scales afford an object which cannot be sufficiently recommended for testing the microscope.

One is less readily exposed to the risk of an illusion in examining the medulla-cells of full-grown yearling shoots of *Syringa*, *Æsculus*, or *Sophora japonica*, than in the young cells previously mentioned; but here also, and especially in *Sambucus* and *Sophora*, when the cell-membrane has acquired a deep blue tinge, we must be cautious, since the contrast between the dark blue of the thick portion of the membrane and the brighter colour of the thin allows the membrane closing the dot to be easily overlooked. If, on the contrary, we expose the specimen from twenty-four to forty-eight hours to the air, till part of the iodine has again evaporated and the cell-membrane has acquired a bright violet colour, we can readily make out the thin and also violet-coloured membrane. When, as not unfrequently happens in the full-grown medulla-cells of *Syringa*, &c., the outer cell-membrane is coloured yellow, and the inner, in which canals of the dots lie, blue, the membrane stretched over the dot appears yellow, in which case also a delusion as to its presence is not easily possible.

The presence of dots on medulla-cells of buds of *Sambucus* shows that we have here no longer to do with a simple membrane; in other cases, *e. g.* in the buds of *Asclepias syriaca*, on the contrary, I found the membrane quite homogeneous and without any trace of dots.

I believe these observations to be decisive, and consider myself entitled to persevere in the view, that the primary cell-membrane is closed.

Another question is, whether the outermost cell-layer, as I believe, or the innermost, as Harting and Mulder assume, is the oldest.

Before I enter upon the action which chemical agents exercise upon the different layers of cell-membrane and the consequences deduced from the appearances observed under such circumstances, I may be permitted briefly to state the reasons which, on anatomical grounds, induce me to declare the most external membrane to be the oldest.

It is a universal phenomenon, that the membrane of young cells and vessels is smooth and thin; that, on the other hand, when the membrane has become thickened in the course of time, two principal layers may be distinguished in it; one exterior, thin, and imperforate, and an interior, of greater or less thickness, pierced with slits and holes. If the holes are small, the inner layer appears as a continuous membrane, pierced like a sieve with holes; if they are large, or elongated into slits and approximated together, it appears as a deposit of fibres, which are sometimes combined in a reticulated manner, sometimes running spirally, sometimes annular, &c. In many cases, *e. g.* in

the cells of the endothecium of anthers, the inner layer forms a continuous layer on one side of the cell, while on the other it is split into fibres which run out like rays from the membranous portion,—a distinct proof that fibres and membrane are merely different varieties of form of one and the same element of the cell. Lastly, it may happen that the inner membrane is only deposited along the angles of the cells, and not on the surface, and forms semicircular borders projecting more or less into the cavity of the cell.

If now it be proved, and I believe that I have furnished the proof in the foregoing, that the membrane of young cells possesses no openings, and if by following the development of cells we see in an indubitable manner that their membrane becomes gradually thicker, and that in these thickened cells, under all circumstances*, an imperforate membrane is present on the exterior, while in the layers lying on the inner side of this membrane, and becoming continually thicker, there are holes which in proportion as these layers become thicker assume the form of canals, which are closed externally and open to the cell-cavity; when we further see that this inner membrane is not homogeneous, but consists of many, superposed, delicate lamellæ,—in these mechanical relations, in the earlier presence of an imperforate membrane and in the subsequent production of the inner, continually thickening mass perforated with holes, lies a necessity for the assumption that this latter layer is of later origin, and has been deposited upon the inner side of the imperforate membrane. In these relations there is throughout no ground for the further assumption that the lamellæ, which constitute the inner secondary layer, have also become deposited in a series from without inwards; but mechanical relations occur in peculiar cases which would make any other assumption appear very improbable. In evidence of this we have the fact, that in very thick-walled cells many of the canals of the dots converging toward the interior of the cell become blended; especially however that in cells which merely deposit a secondary layer in the angles, these possess a form convex toward the cavity of the cell, and consist of many superposed layers convex to the interior; and that in these cases we find in the young cells only few and narrow layers of this kind, while in the full-grown cells a number of broader layers lie upon the inner side of this narrow one†.

These are briefly the anatomical grounds which decided me in

* Those rare cases in which an absorption of the free membrane in the canals of the dots takes place subsequently, from only an apparent exception.

† Vide Bot. Zeit. ii. 323. tab. 2. figs. 2, 3. Scientific Memoirs, vol. iv. p. 106. plate 1. figs. 2, 3.

proposing my theory, and which up to this time have their full value to me, since I know of no anatomical facts which are in contradiction to this theory, or would render any other explanation half so probable. Prof. Harting mentions two circumstances, the first of which he considers makes it unlikely that the secondary layer is deposited upon the inner side of the primary membrane, while the second affords him a positive proof of the deposition of the secondary layers upon the outer side. The first circumstance is the direct correspondence* of the dot in contiguous cells, which it is very difficult to comprehend when we adopt my theory. I confess distinctly that I do not at all comprehend it; I know only that it is so. We do not generally understand the reason of a special organization, because we know nothing of the nature of the power producing organization; thus we do not comprehend, for instance, how it happens that in the putamen of the cocoa-nut the embryo inclosed in albumen is situated opposite an eye. We see the object of this arrangement, but do not understand how it is that it becomes developed at this point of the pericarp rather than in any other situation.

The second circumstance, which Harting brings forward as a proof of the deposition of secondary layers taking place upon the outer side of the primary cell-wall, is somewhat complicated. From a large number of micrometrical measurements (worthy of all praise) which he made on yearling stems of dicotyledons in the course of development†, Harting draws the conclusion that in the internode of a dicotyledonous plant no multiplication of cells takes place in a radial direction after it has passed beyond the condition of bud, but that in the course of the first year the resulting thickening of the internode is to be ascribed to the expansion of the cells already existing in the bud.

In reference to this he distinguishes two periods; in the first, which precedes the thickening of the walls of the ligneous cells, this expansion proceeds in a similar proportion in all the layers

* At the same time it must not be forgotten that this apposition is peculiarly circumstanced. It is true that roundish dots correspond accurately in position and generally in form; elongated and obliquely placed dots, on the contrary, come into apposition only at their middles, and no longer correspond in their form, since they cross; finally, slits (much-elongated dots) which run between spiral or annular fibres, &c. are usually without any relation of position to each other, in contiguous cells. The connexion therefore is not so simple as Harting appears to have conceived, when he assumes that openings from one cell into another occur in the primary membrane which directly correspond; of these however it would be as difficult to explain why they form of exactly the same size and in corresponding situations in the two cells, as it is easy to explain the origin of the dot when my view of the structure of cell-membrane is admitted.

† Tijdschrift voor natuurlijke Geschiedenis, 1844.

of the stem; in the second period, on the contrary, in which the wood-cells become thickened, they expand in a greater proportion than the remainder of the cells, and, indeed, in such a manner that the expansion of their cell-cavities is in proportion to the expansion of the cells which do not become thickened, and that besides this, the radial diameter of the ligneous cells becomes increased by the thickening of their wall. From the circumstance that by the occurrence of a deposition of secondary layers in the cavity, this latter must necessarily be contracted,—that however such a contraction is not indicated by the micrometrical measurement of this cell, the cavity of the cell enlarging to the same size as where no thickening of the wall takes place,—Harting draws the conclusion that the deposition of layers of increment takes place upon the outside of the cell.

Let us examine these assertions as to the ligneous cells somewhat more closely. First, it is stated that in the wood of dicotyledons no multiplication, but only an expansion of cells takes place. Here Harting rests, not so much on the direct counting of the cells lying in the said direction in the woody bundle, as on the estimate depending on the measurement of the cavities and the thickness of the walls of certain of these cells. I wholly disregard the question, whether, from the different magnitude of the ligneous cells, of which those lying in the outer part of the wood are mostly much smaller, while the larger are situated toward the interior, this method of investigation is adapted to furnish an accurate result, and whether Harting has proceeded with the necessary regard to all circumstances in carrying it into effect, since distinct facts exist which demonstrate the view that the ligneous cells do not multiply in a radial direction to be completely erroneous. There is, to go no further, evidence of this in the direct calculation of the ligneous cells which lie in the radial direction in different internodes of the same yearling shoot.

The following calculations were instituted on transverse sections, always from the middle of the internodes, of twigs which were cut off in January, in which therefore all the woody cells of the first year's ring were fully developed. The internodes are indicated from below upward by the numbers 1, 2, 3; that marked 1, however, not being always the lowest internode of the twig. The number of cells refers to the perfect wood-cells lying in the direction of a radius between the pith and the cambium layer. They were counted in those places where no vessels, or as few as possible, lay in the direction of the radius; when however, as is unavoidable in the thicker internodes, one or more vessels were situated in the row of cells, the calculation of the

extent occupied by these vessels was obtained from the cells lying next them*.

a. Twig of *Tilia parvifolia*; 1st internode 149 cells, 5th intern. 110, 8th intern. 79, 13th intern. 29 cells.

b. Twig of *Robinia pseudo-acacia*; 1st intern. 141, 5th 96, 10th 74, 15th 42, 20th 18, 23rd 9 cells.

c. Twig of *Gingko biloba*; 1st intern. 42, 4th 36, 9th 17 cells.

d. Twig of *Morus alba*. Here the interior portion of the vascular bundle, which consists almost wholly of vessels, and in which six or eight vessels lie immediately behind one another in the radial direction, is excluded from the enumeration, and only the number of the wood-cells is determined, which in every internode lie outside this very conspicuous group of vessels: 1st intern. 228, 10th 134, 20th 58, 30th 2—3 cells.

We arrive at similar results if we examine twigs which are actually in a condition of rapid growth; for instance, this was shown by a twig of *Hoya carnosa* about 2 feet long, the leaves of which were yet all in the form of small scales; the 1st internode 20 cells, 2nd 19, 3rd 17, 4th 12, 5th 7, 6th 4. In this case the smaller number of ligneous cells in the upper internodes could not at all be attributed to the circumstance that a larger proportion of the cells were in the condition of cambium cells, since in every internode only three to five cambium cells were situated behind each other in the radial direction.

Calculations instituted on other twigs and in other plants may furnish other numbers; but the great difference in the above numbers renders it incontestable, that at the conclusion of the first period of vegetation the upper and younger internodes contain a much smaller quantity of ligneous cells in the radial direction than the lower and old internodes of the same shoot; also, that during the greater proportionate length of the time of vegetation in the lower internodes than in the upper, a very evident multiplication of cells has taken place.

As it may be objected to the result of the above enumerations (though very falsely, since anatomical examination of young twigs bears evidence to the contrary) that a greater number of wood-cells already existed in a nascent state while the internode was yet in the condition of bud, and that the greater number

* I was originally undecided whether the vessels and cells should be counted together or separately. Neither method however appears to me to furnish so certain a result as that which I have followed, on account of the irregular distribution of the vessels. At the same time, the very immaterial relative differences which arise from these various methods of enumeration are not worth consideration in reference to the general result.

which we meet with in the fully developed condition of the internode is not to be ascribed to the occurrence of a new formation of cells during the summer, it may not be superfluous to direct our attention to a second relation, which decides the fact in the most indubitable manner. In the examination of young shoots of dicotyledonous trees, *e. g.* of oaks, poplars, robinias, &c., we find, without exception, that their vascular bundles run downward from the base of the leaf through several internodes in a parallel direction without entering into any lateral connexion with each other*. The medullary ray lying between two vascular bundles has also a length equal at least to an internode. The same relations are met with also, unchanged, in full-grown twigs in the inner part of the wood, in the so-called *corona*, which corresponds to the young vascular bundles; the larger and more externally situated portion of the wood, on the contrary, exhibits an essentially different mechanical arrangement of its constituent elements. There are, in particular, no longer any separate vascular bundles to be distinguished, but the whole woody mass forms a continuous cylinder, the fibrous bundles of which exhibit not a straight but a serpentine course, and have grown together at certain distances, so as to form a network of narrow and not very long meshes, which are filled up by the medullary rays. In the very young internode there is not the slightest trace of all this reticulated layer, which at the end of the year forms the greater proportion of the body of the wood; in the course of the summer therefore a new part is produced upon the outside of the typical vascular bundle which existed in the bud, and the cells of this part are developed at a later period.

By what we learn both from the increased number of the wood-cells of older internodes as well as from the dissimilar structure of the outer and more considerable portion of their woody bundles, the commonly received opinion, according to which the formation of new wood-cells takes place in the cambium layer during the summer, is fully confirmed, and the theory of Harting, which ascribes the extension of the wood in thickness solely to the expansion of its cells and the deposition of secondary membrane on the outside of their primary wall, is wholly set aside.

In reference now to this latter point, the deposition of the secondary layers outside the primary membrane, it would be naturally very easy to decide the correctness or falsity of this view

* It is not here meant that lateral connexion between the vascular bundles of the medullary sheath is absent in all dicotyledons; on the contrary, I know well that in many dicotyledons the course of the vascular bundles is quite different from what is stated above, but such connexions are found only at the nodes, and are altogether wanting in most trees.

by micrometrical measurement, if it were possible to examine one and the same cell at different periods of its development. Since this is not possible, we are obliged to compare the older and younger cells of the same internode with each other; here however the unequal size which different wood-cells attain brings us into a difficulty which is almost insurmountable, since not only would a vast number of measurements, robbing us of much time, be involved in order to obtain a value moderately approximating the truth if all the cells of the woody mass were developed in a tolerably similar manner, but the detection of alterations which the size of the wood-cells undergoes in the course of time is rendered particularly difficult, by the fact that cells lying in different layers of the ring of wood annually produced attain a different size. However, before I give certain measurements which I made in relation to this, there is a point to be considered which Harting appears to have totally overlooked. The cambium-cells evidently become thickened on all sides in their transition into wood-cells; the cells, which form the innermost layer of the cambium, before becoming thickened, have already pushed forward their walls so as to be in immediate contact with each other laterally, and thus form a circle which straitly incloses the outermost circle of thickened perfect wood-cells. Let us assume with Harting, that during the transition of cambium-cells into wood-cells their cavity is not lessened in size, but that the increment of their walls is referable to the application of new layers upon the outer side of their walls. In this case it would necessarily follow, from mechanical reasons, that the cavity of the cambium-cell inclosed by the primary walls, under these relations, as the side walls would be thickened by each new deposit, would be compressed laterally and the cell must become extended in the direction of the radius, since otherwise the ring formed from the cambium layer must, in consequence of the production of deposits between the side walls of each cell, become expanded to a much more considerable size than they previously possessed, and be torn away from the outer circle of the wood-cells. Since the latter evidently does not happen, we must assume that if the surface of the transverse section of the cell-cavity does not become enlarged in the conversion of the cambium-cells into wood-cells, yet in any case an alteration of form and an expansion of the cell-cavity in the radial direction must take place. Now to prove whether this is really the case or not, I selected a twig of *Hoya carnosa*, which plant appears to me to be especially suited for these investigations, because its wood-cells are of tolerably equal size, and because during the development of its cylinder of wood, the limit between the wood and the cambium shows itself very distinctly. That I might not be exposed

to the risk of selecting arbitrarily for measurement such rows of cells as would best correspond in the form and size of their outermost wood-cells and innermost cambium-cells to a preconceived theory, I measured, with the screw micrometer, in ten rows of cells lying together in a radial direction, the radial diameter of the two inmost cambium-cells and the two outermost wood-cells, as well as the radial diameter of the cavities of the latter. To extend the measurement to a greater number in the radial direction did not appear to me to be at all to the purpose, as the size of the cambium-cells diminishes very rapidly toward the bark; on which account those cells lying further out are much less suitable for comparison with the wood-cells than those cambium-cells at the border of the wood which are closely approaching their conversion into wood-cells.

The average results of these measurements, expressed in fractions of a millimetre, are as follows:—radial diameter of the outer cambium-cell $\frac{1}{102}$, the inner cambium-cell bordering the wood $\frac{1}{96}$, the outer wood-cell $\frac{1}{77}$, the inner wood-cell $\frac{1}{71}$, the cavity of the outer wood-cell $\frac{1}{111}$, and the cavity of the inner wood-cell $\frac{1}{109}$.

[To be continued.]

XVII.—On Zoophytes. By J. D. DANA*.

THE singular features of the growing coral field, the resemblance to vegetation in its productions, as well as their beauty and variety, have long excited the attention even of those little curious in the forms of living nature. Trees, shrubs, and other plants of various kinds are represented with wonderful exactness, as if they had been the types of this branch of the animal kingdom; and they grow mingled together often in rich profusion like the plants of the land. The similarity, moreover, is not confined to general form: corals have their blossoms; for polyps are flowers both in figure and beauty of colouring. Like the pink or Aster, they have a star-like disc above; and while some are minute, others are half an inch or even two inches in diameter. Every part of a Madrepore when alive is covered with these blossoms:

* From Silliman's American Journal for July 1846.

In the series of articles on Zoophytes, which it is proposed to prepare for publication, the writer presents the facts and principles that have been published in his Report on Zoophytes, one of the volumes of the late Exploring Expedition under Capt. Charles Wilkes. The subject is however condensed, and the style and arrangement altered to adapt it to these pages, and give it a somewhat more popular character. It is the writer's endeavour to present a succinct account of this department, about which there is little generally known, without confining himself to original observations.

a Gorgonia, though merely a cluster of naked stems, as seen in our cabinets, consists, when in the water, of as many crowded spikelets of flowers. Thus it is with all zoophytes. Nothing could be more untrue than the night-mare dreams of a favourite poet* :—

“Shapeless they seem’d, but endless shapes assumed;
Elongated like worms, they writhed and shrunk
Their tortuous bodies to grotesque dimensions.”

And again, they are described as issuing from the coral, like

“capillary swarms
Of reptiles horrent as Medusa’s snakes.”

Polyps are not writhing worms. The choicest garden does not produce flowers of more graceful figure or gayer colours than those of the zoophyte reef; and we may add too, that the birds of the groves will not rival the rich tints of the fishes that sport among the coral branches. The coral tree is without verdure, but there is full compensation in its perpetual bloom.

It is not surprising that these resemblances should have misled early investigators. For a long period only the external forms of zoophytes were known, and every analogy observed authorized their arrangement with plants†. The discovery of the flowers or seed of corals was yet to be made to prove the identity; and at last, Marsigli, an active explorer of the Mediterranean, came forward with this veritable discovery itself, and published figures of “*les fleurs du corail*”—the coral blossoms‡. Other discoveries followed: but it was soon shown that these flowers were gifted with the attributes of *animal* life. This observation is said to have been first made by Ferrante Imperato, a naturalist of Naples, who published his ‘*Historia Naturale*’ in 1599§. It was however demonstrated independently, as is believed, and more thoroughly, by Peyssonel, who wrote an elaborate memoir on certain species examined by him in the West Indies||. But before a transfer of

* Montgomery’s Pelican Island.

† Among the authors who arranged corals with the vegetable kingdom are Dioscorides, Cæsalpin, Bauhin, Ray, Geoffroy, Tournefort and Marsigli.

‡ Marsigli, *Physique de la Mer*, Amsterdam, 1725. His first observations were made in 1706.

§ See Blainville’s *Manuel d’Actinologie*, p. 14.

|| Peyssonel’s *Memoir* covers 400 pages of manuscript. It was sent to the Royal Society in 1751, and an abstract of it was read, which appeared in the ‘*Transactions*’ for 1753 (vol. x. of the *Abridgement*). The memoir, though for many years supposed to be lost, is still extant in the library of the museum at Paris; and a late notice of it by M. Flourens may be found in the ‘*Annales des Sciences Naturelles*,’ 2nd ser. ix. 334, 1838.

Dr. J. Parsons made a laboured and apparently successful reply to Peyssonel before the Royal Society in 1752, in which he argues *ab ignorantia*: “It would seem to me much more difficult to conceive that so fine an arrangement of parts, such masses as these bodies consist of, and such regular

zoophytes from the vegetable to the animal kingdom was generally allowed, the subject was one of warm debate among the philosophers of the day. The animals detected were suspected of being parasites, and pronounced as too inefficient for the production of trees of stone with their spreading branches; while the formation of coral was attributed to a kind of vegetable growth by some, and to mineral aggregation or crystallization by others*. The scientific world was divided, and Reaumur in his earlier writings condemned the new views advocated by Peyssonel as too absurd to be discussed. The investigations of Trembley on the Hydra polyps, and of Jussieu on other species obtained on the sea-coast of France, finally convinced Reaumur. Ellis, by a laborious series of investigations, led the way in England; and though his facts were doubted by some, they were soon received with full credit†. The figures of these authors represented actual flowers as regards form; but these flowers were shown to have a mouth, and to be capable of eating like animals. They were actually fed, and the process of digestion watched through its different stages. Moreover they were shown to be an essential and constituent part of the zoophyte. The petal-like organs which produce the striking similarity to flowers were observed in some instances to be used as arms in taking their prey and conveying it to the mouth, for which purpose they were conveniently arranged in a circle around the mouth. The coral blossoms were consequently declared to be animal in every essential character. Yet Linnæus, after long hesitation, advanced no further than to admit for zoophytes an intermediate nature between plants and animals. Thus more than a century elapsed, after the discussion commenced, before this one simple fact in science became generally believed, that zoophytes are animals, and resemble plants only in sometimes assuming the shapes of vegetation. The point is now no longer doubted.

In these remarks we exclude sponges from the class of zoophytes. Their nature is still a subject of dispute, and some of

ramifications in some, and such well-contrived organs to serve for vegetation in others, should be the operations of poor, helpless, jelly-like animals, rather than the work of more sure vegetation, which carries on the growth of the tallest and largest trees with the same natural ease and influence as the minutest plant."

* P. Boccone, 'Museo di Fisica,' &c., Venice, 1694, 1 vol. 4to, with figures. Baker, 'Employment for the Microscope,' pp. 218—220. London, 1753.

† Ellis published various memoirs in the 'Philosophical Transactions' from the years 1753 to 1776, and also a work entitled 'Essay towards a Natural History of Corallines,' 4to, with plates, London, 1754. A posthumous work of this author was afterwards published by Solander, under the title, 'The Natural History of many curious and uncommon Zoophytes,' 4to, with 63 plates, London, 1756.

the most distinguished names in science are committed on opposite sides. If animals, they have only the most general properties of animal life, and are less nearly related to polyps than to the infusorial animalcules. They are arranged with the latter by Dujardin.

Though zoophytes have no connection with the vegetable kingdom, polyps may be styled with much propriety *flower-animals*. The word zoophyte*, originally used by Linnæus, alluded to their supposed intermediate nature. Still, the name is sufficiently appropriate, although the idea in which it originated is exploded. They are plants in form even to the coral-polyps which blossom over the surface; yet in the mode of receiving, digesting and assimilating nutriment, and every other function of life, they are animal.

The relation of the coral to the coral animal, and the mode of its formation, are subjects about which much error has been published; and although now correctly explained in some scientific treatises, very erroneous impressions largely prevail. Without entering into particulars in this place, one single fact should be here stated and duly considered; it is this:—coral is not the residence or hive of polyps; on the contrary, it is contained *within* the polyps, instead of containing them. It is formed *within* them by animal secretion, as bones are formed within other animals; and in most living zoophytes it is wholly inclosed, showing not a spine or point externally. This is the case with the Madrepore; no part of the coral is seen externally while the animal is alive in the water. The idea that coral polyps retreat into cells is therefore wholly without foundation. Sometimes the summit or flower-shaped part of the polyp becomes concealed, in a manner a little similar to the withdrawal of a turtle's head; but even this semblance of retreat is by no means general among the ordinary coral zoophytes.

There is no mechanical accumulation of material by the polyp: they are as unconscious of the coral secretions going on within

* The word zoophyte is from the Greek ζῷον, *animal*, and φύω, *to grow like a plant*. Blainville states that the term was introduced by Sextus Empiricus and Isidore de Seville in the sixth century. It has been differently restricted in its use by authors, and, on account of its various applications, is wholly rejected by Lamarck. Other late scientific writers retain it, and it is also the popular designation.

Ehrenberg has proposed to substitute *Phytozoa*, derived from the same roots. But science requires a name that will apply to the whole compound structure—the coral tree, sea-fan, or mass of whatever shape; and phytozoon refers only to a *single* polyp, or phytozoa to polyps in general. These cannot supply the place of the very convenient terms zoophyte and zoophytes. Moreover, the term phytozoa or phytozoaires (plant-animals) has been applied to the minute monad-like cellules found in the tissues of some plants, and supposed to be animalcules or plant-entozoa.

them, and as free from actual labour and industry, as we are in the construction of our bones.

The existence of such terms in the science as *polygyny*, *polygyny*, applied to coral, signifying a *hive* or *house of polyps*, indicates the errors of former days; errors which science should not perpetuate. As a substitute, the old term *Corallum** is convenient and unobjectionable. *Corallium* has been rejected because of its application to a particular genus of corals. In *Corallum*, we have a familiar word, and one which implies no hypothesis or erroneous comparison. The analogy between the work of the polyp and that of the bee or ant, though often suggested, is wholly without foundation.

The existence of coral secretions is by no means essential to the existence of polyps. Although a large number of species form coral, there are also many that are wholly fleshy, or secrete only a few scattered granules of lime. The *Actinia* or sea-anemones, as they are familiarly called, are examples of these fleshy species. In every point of structure, and in every function, except that of coral-secreting, they are identical with coral animals. They have also the same resemblance to flowers when expanded, and their rich tints and large size make them the most brilliant flower-animals of any seas.

One of the most singular characters of zoophytes is their frequent compound nature. The branching Madreporite is an example of this *compound* structure. There are hundreds of polyps united in a single individual; each little prominence containing a cell pertained to a separate animal; and by counting these prominences over a branch of coral, the number of flower-animals combined in its production may be ascertained. In the same manner, in Astræas, each radiate cell or depression over the surface marks the site of a polyp. The many animals, though distinct in some functions, are still mutually dependent in others, as we shall explain in the sequel.

Although these compound forms are most common, yet there are other zoophytes which are always *simple* polyps. The coral in such cases is a single isolated cup or radiated disc, and the coral animal is a solitary flower. These simple polyp-flowers

* Coral has been variously designated in both ancient and modern times. The terms *Corallium*, *Corallum* and *Coralium* were all used by the ancients, and their derivations and use are discussed at length by Theophrastus in his work on plants, book iv. *Κορράλιον* is the ancient Greek form, as says Dionysius, *πάντη γὰρ λίθος ἐστὶν ἐρυθροῦ κορραλίου*. The more recent Greeks, among whom are Dioscorides and Hesychius, wrote the word *κοράλλιον*. Among the Latins, Ovid wrote, "*Sic et coralium quo primum contigit auris tempore durescit.*" Avienus uses *Corallum*. Among the derivations suggested, that of *κόρη*, *damsel*, and *ἄλς*, *sea*, appears the most probable.

instead of being microscopic are often of large size. While many are but one or two lines in diameter, others are one or two feet. The large *Fungia*, with its stellate surface and sprinkling of emerald tentacles around its central mouth, is one of the most beautiful objects of the coral reef.

The foregoing remarks are presented as an introduction to a more particular account of the structure and habits of zoophytes.

XVIII.—*Observations on the Generation of Ixodes.*

By Prof. GENÉ. Communicated by ALFRED TULK, M.R.C.S.

THOUGH some time has now elapsed since a paper bearing the above title was read by Professor Gené of Turin at the Scientific Association held in Milan in 1844, and subsequently reported in its 'Transactions' during the past year, we have been induced to avail ourselves of the latter source to give the reader an account of the facts therein recorded concerning the manner in which the generative functions are performed by both sexes of a genus of Tracheary Arachnida, belonging to the tribe *Acarides*; and in trespassing upon the reader's attention thus late in the day, we would urge as an excuse the very striking relation, if only approximative in kind, between the organ employed by the male *Ixodes* to copulate with the female, and the palpi as ministering to similar uses in the *Araneides* or true Spiders. The Professor showed how DeGeer had been the first to observe the copulation of the *Ixodes*, which act consists on the part of the male, which is very much smaller in size than the female, introducing its rostrum into the orifice situated upon the middle of her sternum between the coxæ of the last pair of legs; but inasmuch as neither DeGeer, Hermann, and subsequent naturalists were certain whether this strange union was actually one of a sexual character, he commenced by adducing a large number of observations of his own, tending to remove any doubt that might exist upon the question, by proving that the male actually inserts his rostrum and that only into the female aperture, and that its fecundating organs consist of two small white and fusiform bodies which during this insertion emerge on the right and left of the inferior labium, while upon the retraction and consequent disappearance of these organs, the male, being then detached from the female, scarcely appears the same creature.

In the year 1806 Chabrier had announced that the females of *Ixodes* gave birth to their ova through the oral opening or mouth; a statement, however, refuted ten years afterwards by Pastor Müller of Odenbach, who observed that the ova issued from the proper sternal canal of the female, who in expelling each ovum

effected this by means of a conical and tubulose tubercle. This observation, tending to contradict the assertion of Chabrier, was afterwards repeated and confirmed by Lucas, but neither he nor Müller had seen the half of what takes place in *Ixodes* during the emission of ova.

The female of *Ixodes*, after having been fecundated by one or by several more males in succession, proceeds without any delay to perform this long operation. To this effect she commences by depressing upon the sternum all the palpi that compose the rostrum, when there is seen to be protruded with an easy gliding motion from beneath the dero-cephalic plate a turgid vesicle of a white colour, and which from its being terminated by two lobes of equal consistency and colour, having at their apex a most minute aperture, our author designates provisionally the *vesica biloba*. When this organ, which had been seen neither by Müller nor Lucas, has been well dilated so as to project beyond the rostral palpi, the animal everts the pectoral canal and gives exit to the oviduct, which being protruded like the feeler of a snail, proceeds at once to disburden itself between the lobes of the vesica. This clasps, compresses, and appears as if sucking the oviduct for a few seconds; but after this the oviduct is retracted, re-enters the sternum, leaving an egg between the lobes of the vesicle, which clasps it firmly, turning it to and fro in all directions, and vibrating now and then in a spasmodic manner. Four or five minutes having elapsed, during which time the ovum remains between its lobes, the vesicle disappears by re-entering its internal situation; the ovum is left upon the inferior labrum, and this being elevated along with all the palpi that compose the rostrum, thrusts the ovum upon the dero-cephalic plate or in front of the body. These acts are renewed for as many ova as the female may have to discharge.

The Professor did not know what might be the office of this bilobed vesicle. He suspected at first that it might be the receptacle of the semen: that deposited by the male during coition in the oviduct was transferred thither, so as to accumulate, by means of some internal channel, but the existence of such a communication the anatomy failed to reveal, added to which it would require too long and improbable a transit. He imagined likewise that from this organ might issue the glutinous fluid with which the ova are besmeared, but this conjecture also had to be renounced, upon ascertaining that they were already viscid and adhesive at their immediate exit from the oviduct. In such a state of doubt recourse was had to an experiment, which produced the following important result. Having punctured, with the point of a fine needle, the *vesica biloba* of various pregnant females, so as to prevent its further distension, he then saw, that

while the ova in uninjured females, after passing through that organ, remained turgid and were hatched in due time, that they now, from undergoing no intermediate process, fell from the oviduct, shrivelled up readily and died. Whatever therefore might be the real use or action of the bilobed vesicle, its very primary importance was at all events determined by the death or life of the ova, depending upon its being injured by puncturation or not.

The remainder of the paper was devoted to the prodigious fecundity of *Ixodes*, the females of which, according to their individual size, and the species whereunto they belong, give birth to more than a thousand ova, being so employed, without intermission, from ten to thirty consecutive days. To deposit these ova, the female when in a mature state of pregnancy detaches herself from the animal upon whose blood she has lived as a parasite by suction and falls to the ground; the young, which are hatched sooner or later according to the heat of the season, remain for some time quietly congregated together, but at the first impulse arising from want of food, they part company, and ascend the stalks of herbs and shrubs to await the passing by of that animal upon which instinct bids them subsist. They have then only six legs; but after the change has taken place, when the old rostrum and integuments are left adhering to the skin of the animal upon which they prey, they are then shown to be in an adult and perfect state, that is, furnished with eight legs. The whole paper, rich in facts, and of which the above is an abstract, was illustrated when read by a wax model of the female *Ixodes* as seen, when largely magnified, in the act of depositing her ova. It is to be hoped that some such masterly observer and arachnologist as Mr. Blackwall among our own countrymen may furnish us with additional evidence relative to the singular facts here recorded.

XIX.—*Description of the Species of Cephalophus* (H. Smith) in the Collection of the British Museum. By J. E. GRAY, Esq., F.R.S. &c.

THE determination of the species of Antelopes has for a long time been considered one of the most difficult programs in zoology, and the Tufted Antelopes have perhaps been the least studied of the group. Finding, when revising the nomenclatures of the species of this genus in the British Museum collection, that there were several which do not yet appear to have been described, and that they appeared to have more prominent characters than have hitherto been given to them, I have ventured to send you for publication in the 'Annals' the result of my revision of the group.

The genus may be divided into sections by the shape and length of the ears.

- I. *The ears elongate, nearly as long as the head, acute ; horns elongate, slender ; forehead flat.*

1. *C. mergens*. 2. *C. Campbelliæ*.

- II. *Ears moderate, half as long as head, rather acute ; horns short.*

3. *C. coronatus*.

- III. *The ears short, not half as long as the head, rounded at the end ; horns short.*

† *Black, white dorsal spot, no eye streak.*

4. *C. sylvicultrix*.

†† *Fulvous, black dorsal streak, no eye streak.*

5. *C. Ogilbii*. 6. *C. dorsalis*.

††† *Fulvous or black, no eye streak.*

7. *C. niger*. 8. *C. natalensis*. 9. *C. rufilatus*.

†††† *Gray brown, with a pale eye streak to base of the horns.*

* *Fur one-coloured, hair uniform.*

10. *C. Maxwellii*.

** *Fur one-coloured, hair black and gray intermixed.*

11. *C. monticola*. 12. *C. melanorheus*.

*** *Fur grised, hair yellow rayed.*

13. *C. punctulatus*.

Professor Sundevall has in his specific characters laid some stress on the direction of the lacrymal streak, but I find on comparing different specimens of the same species that little reliance can be placed on this character, in stuffed specimens at least ; for the direction of the streak is altered according as the skin of the face is more or less stretched.

1. The Duyker or Duyker Boc, *Cephalophus mergens*. *Antelope mergens*, Blainv. Bull. Soc. Phil. 1817 ; H. Smith, G. A. K. v. 264 ; Licht. Saugth. t. 11 ; Harris, W. A. Afr. t. 15. *A. nictitans*, Thunb. Mem. Petersb. iii. 312. *A. Burchellii*, H. Smith, Griffith, A. K. v. 262. *A. Ptoox*, H. Smith, Griffith, A. K. v. 265 ? *A. platous*, H. Smith, G. A. K. v. 266. *Moschus Grimmia*, Linn.

Yellowish brown, grayish in winter ; hair yellowish, with blackish tip ; forehead yellowish bay ; chin, throat, abdomen, inside of ears and under side of face white ; feet, streak on the nose, up the legs, and upper part of tail black ; ears elongate, nearly as

long as head, acute; horns black, elongate, slender, base rugose and subangular in front.

Inhab. S. Africa.

This species varies greatly in the intensity of the colours and in the extent of the black on the feet and nose. In one young specimen in the British Museum the black on the nose is quite deficient; and a newly born specimen has the bright colouring of the breeding-season, and is bright bay on the crown.

The specimen of *A. platous* in the London Missionary Society's Museum appears to be only a pale specimen of *C. mergens* without the black nose streak.

2. The Black-faced Philantomba, *Cephalophus Campbelliæ*. *Antelope Grimmia*, Pallas, Spec. Zool. xii. 18. t. 1?? *C. Burchellii*, var. (*C. Campbelliæ*), Gray, Cat. B. M. 162.

Gray and black, grised; belly white; cheeks, neck and chest yellowish; forehead yellow, with a black streak on the nose widening on the forehead and ending in a tuft behind the horns; feet and front of fore-legs reddish black; fur soft; hair gray, with black subterminal ring and tip; ears elongate, acute.

Inhab. S. Africa.

This species agrees in most respects with Pallas's description of an animal from Guinea; his name unfortunately cannot be retained, as there are three *A. Grimmia* :—

1. The *Capra sylvestris africanæ* of N. Grimm. Misc. Cur. Norimb. 1705. 131. t. 13, the authority for *Capra Grimmia*, Ray, Syn. 80, and Linn. S. N. (ed. x.) 70. *Moschus Grimmii*, Linn. S. N. ed. 12. from the Cape, of a dull gray colour. Probably the Duyker, *C. mergens*.

2. *Le Grimme* of Buffon, II. N. xii. 307. 329. t. 41. f. 2. 3. from a head sent from Senegal by Adamson, the *Antelope Grimmia* of Desmarest, F. Cuvier, and H. Smith, &c., the *C. rufilatus*.

3. The *A. Grimmia* of Pallas, like the above.

"*Fitomba*" or "*Philantomba*" appears to be the generic name of all the W. African *Cephalophi* or Bush Antelopes.

The *Cephalophus quadriscopa*, H. Smith, Griffith, A. K. t. 188, the only well-described species which we do not possess, appears to belong to this section; it is peculiar as being the only bush goat with knee tuft, and the only antelope with tuft on the hind as well as the fore-legs.

3. Red-crowned Bush Buck, *Cephalophus coronatus*. *C. coronatus*, Gray, Ann. N. Hist. x. 1842, 266. *Ant. Madoqua*, Ruppell, Faun. Abyss. t. 7. f. 2; Sundevall.

Pale yellowish brown; middle of back, and part of fore legs varied with a few scattered black hairs; crown bright bay; crest

blackish brown, bay in front; feet and streak up the nose blackish; inside of ears, chin, throat, chest, belly and hinder legs whitish; horns short, conical.

Inhab. W. Africa. Mr. Whitfield called it *Coquetoon*.

There is an adult female in the collection of the Earl of Derby; a nearly adult male and two young females in the collection of the British Museum; the two latter brought by Mr. Whitfield with the female before mentioned.

4. White-backed Bush Buck, *Cephalophus sylvicultrix*. *Antelope sylvicultrix*, Afzelius, N. Act. Upsal. vii. 123; II. Smith, Griff. A. K. t. 187.

Blackish brown, minutely gristled; hair brown, with whitish tip; back with a large yellowish white spot, narrow in front; throat, chest and belly redder; crown, nape and legs darker.

Inhab. Sierra Leone.

Varies in the size of the dorsal spot.

In the British Museum is a young male. Length 29 inches; height 18; tarsus 6.9.

5. Black-striped Bush Buck, *Cephalophus Ogilbii*, Gray, Ann. N. Hist. 1842. *Antelope Ogilbii*, Waterh. P. Z. S. 1838, 60.

Pale bay brown, with a deep black dorsal streak, beneath pale; crown and haunches brighter bay; neck and withers, and sides of the dorsal line varied with deep brown hairs; streak up the foreleg, upper part of hock, feet (above the hoof) and end of tail blackish; horns short, thick, conical, very rugose on the inner front edges of the base.

Inhab. Fernando Po. J. Thompson, Esq.

6. Bay Bush Buck, *Cephalophus dorsalis*.

Dark bay; shoulders and legs darker; the crown and nape, broad streak along the back, hair brown, a few on the haunches white-tipped; end of the tail black, darker near the tail; sides of the chin, front of chest, and inside of the thigh pale brown.

Inhab. Sierra Leone. Called Bush Goat.

In the British Museum a young male brought to this country by Mr. Whitfield, which died in the Surrey Zoological Gardens.

7. Black Bush Buck, *Cephalophus niger*. *Antelope niger*, Mus. Leyden.

Sooty-black, grayer in the front half of the body; chin, throat, abdomen and inside of thighs gray; forehead, crown, dark bay and black mixed; cheeks pale brown and black varied; tail end whitish.

Inhab. Guinea.

In the British Museum there is a male from the Leyden Mu-

seum nearly as large as the former. There is at Knowsley a Bush Buck, which is now shining black with a reddish brown crest; when young it was red on the sides; it is perhaps the same as the above.

8. Natal Bush Buck, *Cephalophus natalensis*. *Antelope natalensis*, A. Smith, S. Afr. Quart. Jour. 217; Ill. Z. S. A. t. 32.

Bright red bay; nape, withers and feet varied with dark gray hairs; nose-streak short, blackish; lips, chin, upper part of throat and end of tail white; lower part of cheek, throat and abdomen pale yellowish; crown and tuft bright red; horns short, conical.

Inhab. S. Africa. Port Natal.

There are five specimens of different ages in the British Museum: this species resembles *C. Ogilbii* in size and colouring, but wants the dorsal streak.

9. The Coquetoön, *Cephalophus rufilatus*. *A. Grimmeria*, H. Smith, G. A. K. v. 266. *Grimme*, Buffon, H. N. xii. t. 41. f. 2, 3; F. Cuv. Mam. Lithog. t. . not good.

Deep reddish bay; the legs, nape, streak on the nose to the crown and broad streak on the back blackish gray; ears blackish; crest and upper part of tail black; cheek rather paler; chin and abdomen pale yellowish; inside of ears whitish, with a brown spot on the outer side; horns conical, rather elongate, obscurely annulated, slightly recurved.

Inhab. Sierra Leone. Village of Waterloo. Called *Coquetoön*.

The hair is rather paler at the base, of the dorsal streak gray, with a blackish tip.

There is a male and female in the museum of the Earl of Derby, and a young female in the collection of the British Museum, presented by the Earl of Derby. The male is 27 inches high. Length 15; at the tarsus 5.6; the horns are nearly 3 inches long.

M. F. Cuvier's (Mam. Lithog. t.) figure is evidently intended for this species, but it is much paler than any specimen I have seen, and the distribution of the colour of the separate head appears to have been taken for the *Guevei*?

10. The Guevei, *Cephalophus Maxwellii*, H. Smith, G. A. K. v. 347. *A. pygmea*, Pallas, Spec. xii. 18. front. *The Guevei*, Buffon, not Licht. *A. pygmea* (*Guevei*), F. Cuv. Mam. Lithog. t. . good, H. N. xii. t. 43. f. 2. horn? *Antelope Frederici*, Laur., Sundevall. *A. Philantomba*, Ogilby.

Gray brown or sooty brown; sides of head and body grayer; chin, throat, chest and belly whitish gray; abdomen and front of

thigh white ; broad streak over each eye to the base of the horns yellowish white ; feet and end of nose rather darker ; fur rather rigid ; hair uniform.

Inhab. W. Africa.

This species is known from *C. monticola* by being larger, by the white of the eye streak and the white on the front of the thigh and chest and the rigidity of the hair.

There is an adult male and female of this species in the British Museum ; the male is bright sooty brown, darker near the rump ; the female is nearly uniform pale gray brown. It is well-figured by M. F. Cuvier.

11. The Blau Boc or Cape Guevei, *Cephalophus monticola*. *A. monticola*, Thumb. Stockh. N. H. xxxii. t. 5. *Antelope cærulea*, H. Smith, Griffith, A. K. v. 855 ; Daniell's Afr. Scenery, t. . *A. perpusilla*, H. Smith, Griffith, A. K. v. 854. *A. pygmea*, Licht. S. t. 16, Desm., Sund.

Gray brown ; streak over the eyes, legs and outer part of thighs rufous ; feet gray brown ; chin, chest, abdomen, and under side of tail and inside of ears white ; fur soft gray with intermixed rather rigid black hairs.

Inhab. South Africa.

The colours vary in intensity in a female in the British Museum ; the rufous colour of the thigh and the white of the breast are more distinct than in the male, but this depends on the season when they were killed.

A very young fawn, which was brought home from the Cape by M. Verreaux, is darker, and the reddish tint extends over the head and the whole body.

12. The Black-rumped Guevei, *Cephalophus melanorheus*. *Cephalophus Philantomba*, Gray, Cat. Mam. B. N. 163.

Gray brown ; throat and sides paler ; rump and upper part of tail black ; chin, chest, abdomen, back and front edge of thighs and under part of tail white ; narrow streak over the eyes whitish ; feet like the back ; fur soft, pale gray, with intermixed rather rigid black hairs.

Inhab. Fernando Po. J. Thompson, Esq.

There are two specimens of this species in the British Museum ; they are easily known by the black mark on the rump ; they are coloured like the *Guevei* from W. Africa, but smaller, and have the soft fur and interspersed black hair of the Cape Guevei, *C. monticola*.

13. The Grisled Guevei, *Cephalophus punctulatus*. *A. Philantomba*, H. Smith, G. A. K. ?

Dark fulvous brown ; sides and legs rather paler ; narrow streak

over the eyes and inside of ears pale brown, chin, throat, chest, belly and front of thighs and under part of tail white; hair gray at the base, with a brown and yellow subterminal ring; crown and upper part of tail darker; feet pale, varied.

Inhab. Sierra Leone.

We have a young specimen of this species in the British Museum, presented by Col. Sabine, R. E.

It is at once known from the other *Gueveis* by the fulvous colour which is produced by the yellow subterminal rings of the hairs.

Professor Sundevall in his Monograph recognises six and cites four doubtful species (Vet. Acad. Hand. 1844, 190).

XX.—*The Birds of Calcutta, collected and described by*
CARL J. SUNDEVALL*.

[Continued from p. 110.]

7. *Pica rufa*, Vieill., Wagler, Isis, 1829, p. 751. *Rufa*, capite colloque nigro-fuscis; vitta alarum caudaque canis; remigibus plerisque totis, rectricibus omnibus apice nigris. Longit. $15\frac{1}{2}$ poll., cauda $9\frac{1}{2}$; ala 148 millim., tarsus 29. Iris rufo-fuscescens. ♂ et ♀ similes.

In Bengal the place of our common magpie is supplied by this bird, to which in form and marks it bears a close resemblance, but the Indian bird is a little smaller and red-brown instead of white. Its common screaming sounds are like those of our magpies, but instead of that feeble indistinct sound which they make in spring and which is their only song, the *Pica rufa* sends forth clearer and stronger tones, which sound like *koolee-oh-koor!* and at times *hohlee-oh!* (c f, c, c, Da Capo, c, d, c). In this the Hindoos hear the word *Halitshatsha*, which is the name of the bird in the Bengal language. It is common and stationary in the neighbourhood of Calcutta. It is mostly seen in trees, and although a little shy like our magpie, it seemed not very willing to fly. In the stomachs of those I examined there were only insects, chiefly grasshoppers. It did not seem to despise meat, but I never saw this kind touch any remains of carrion.

8. *Lanius phaniscus*, Pallas †.—*L. collurio* var. Gloger. *L. cristatus*, Linn. sec. Edw. 54. *L. lucionensis*, Briss., Linn. *L. superciliosus*, Lath. sec. le Rousseau, Levaill. Ois. Afr. 66. 2. (e Bengalia; nec *L. superciliosus*, Licht. Cat. et Gloger, ex Afr. = *L. rufus* var.) *L. melanotis*, Valenc. Dict. Sc. Nat. 40. p. 227.

* Translated from the 'Physiographiska Sällskapets Tidskrift' by R. Bertram, with Notes by H. E. Strickland, M.A.

† This name is characteristic; the two older names, *cristatus* and *lucionensis* are altogether unsuitable.

Rufus, subtus albidus, macula alarum alba nulla; cauda unicolore, rufa. Remigum 4a sublongiore quam 3a; 5a longiore quam 2a. Rectrices extimæ circa 22 millim. breviores quam mediæ. Simillimus *collurioni* sed eodem jure quo *L. rufus* distinguendus; melius forsan omnes conjungerentur. *L. collurio* differt, præter colorem maris, remigibus 4 et 5 brevioribus quam 3 et 2; cauda subbreviore, semper ex parte alba, penna extima circa 12 millim. brevior quam mediis; ala paullo longiore, tarsoque paullo brevior.

♂ perfecte coloratus. Superne totus læte cinnamomeus, unicolor; subtus albus, lateribus corporis dilute rufescenti-tinctis (nec roseis). Macula per oculos (ut *collurionis*) nigra, superne cum fronte latius albo limbata. Cauda unicolor, immaculata, colore dorsi. Ala colore simillima *collurionis* (macula oblecta definita, alba, &c.). Rostrum et pedes nigri. (Indiv. unicum Mus. Stockh. patriæ incertæ.)

♂ (hiemalis?) Similis præcedenti sed colore rufo minus puro, et in dorso sordide infuscato. Tinctura rufescens latius in pectore crissoque extensa. Latera trunci ventrisque, interdum pectoris, striolis transversis, undulatis nigricantibus. Alæ macula oblecta alba indefinita. Rectrices apice pallido limbatae, carent autem striola fusca intramarginali junioris. Rostrum basi pallescens, pedesque nigro-fusci. Iris obscure rufescens. (Indiv. e Calcutta, Febr. Mus. Gyllenkr., Lund., Stockholm.)

♀ Ut *L. collurio* ♀ sed cauda vix albedo limbata, nisi apice, nec transversim undata, dorsum postice et caput lætius ferruginea. (Indiv. Calcutta, Martio; Mus. Stockh.)

Junior 1o anno. Simillimus *L. collurioni* ejusdem ætatis, cauda magis rufescente; pennis medio minus fuscis; extima tantum paullo rufescenti albedo limbata. (Indiv. e Bengalia in Mus. Lund.; "ex India," Mus. Stockh.)

Mensuræ adnotatæ (millimetra):—

<i>L. phœnicurus.</i>								<i>L. collurio.</i>				<i>L. rufus.</i>				Var.	
	♂	a	b	c	d	♀	a	b	♂	♀	♂	a	b	c	d	superc.	
Alæ...	90.	87.	85.	85.	88.	88.	83.	83.	96.	95.	95.	93.	100.	100.	100.	99.	98.
Tarsus	23.	24.	25.	21.	23.	23.	23.	23.	22.	23.	21.	21.	23.	23.	22.	21.	22.
Cauda	...	85.	86.	88.	92.	...	77.	...	78.	78.	80.	76.	...	80.	77.	79.	...

Lanius phænicurus ♂ a est supra descriptus "perfecte coloratus." Pullus b e Java? Mus. Stockh. differt colore pallidiore rostroque validiore, sed vix specie distinctus*.

L. rufus b, ex insula Rhodo; c et d, ex Ægypto, transitum ad varietatem "*superciliosum*" [Licht. nec Lath.] præbent.

L. collurio, omnes e Scania, adulti.

The above-described bird I saw several times in the neighbourhood of Calcutta in February, March, and latest on the 1st of May; it is therefore stationary. According to Pallas and Gloger it is even found in Siberia, and according to Brisson in the Philippine islands; but it is probably rare in Europe and

* This is the variety termed *L. magnirostris* in Bélanger's Voyage, which our author is probably correct in referring to *L. phænicurus*.—H. E. S.

Africa, and is there replaced by our common red-backed shrike (*L. collurio*), which extends from Sweden to the Cape, but which seems not to be met with in Asia. These two birds, which are not *remarkably* unlike in anything except the colour of the male, seem therefore to constitute an easterly and a westerly race of the same genus, each of which in its district goes through nearly all climates. As far as I could observe, the Asiatic species follows the same mode of living as ours; has the same flight and mode of perching on the top of bushes, the same syllable *tshack! tshack!* as well as restless but bold and powerful actions; and I doubt not that some remains of insects which I once found spitted on a thorny bush were a proof of its entomological habits. I could not learn anything about their propagation, and regret the shot which was fired at a male May 1st. Although the Bengalese recognise the common kinds of birds pretty well, and have a certain name for most species, yet all of whom I inquired were in doubt as to the name of this bird. Still they gave me the same name as that given to Buchanan (according to Lath. 'Gen. Hist.' under *Lan. rufus*), viz. *Curcutea*; but the same name is used for several other species, and according to the above-mentioned authority is even used for little screaming children. Edwards (*l. c.*) says that in Bengal it is called "*Charah*."

9. *Edolius balicassius*, Cuv.—*Monedula philippensis*, Briss. *Corvus balicassius*, Linn. *et auct.* Drongup, *Levaill. Ois. Afr.* 173 (ex India, plumis frontis nimis elevatis). *Dicrurus lophorhinus*, Vieill. *D. balicassius?* Vig. *et Horsf. Linn. Trans.* v. 15. Rajah Shrike, Lath. *Gen. Hist.* (junior)*.

Niger totus, dorso cæruleo nitente, fronte lævi; cauda valde divaricata, corpore longiore; rostro convexo, carina rotundata; remige 4a reliquis longiore, 5a tertiam subexcedente. Long. 11—12 poll., cauda 6—7; ala 140—150 millim., tarsus 21.

♂ nitidior, plumis frontis leviter curvatis. Iris obscure rubra. Rectrices mediæ 105 millim., laterales 170. (Calcutta, 15 Febr. 1 Mai.)

♀ paullo minor, fronte lævi. Iris paullo fuscior. Rectrices mediæ 115 mill. extimæ 160.

Juv. opacus, fuliginoso tinctus in ala caudaque. (Calcutta Martio.) (Juv. prima ætate forte = *Lan. cærulescens*, Linn.?) Rectrices laterales longissimæ, valde arcuatæ, apice latiusculæ, rotundatæ. Lingua apice bifida lacera, similis *Lanii collurionis*. In aliis *Edoliis* (e. g. *E. malabarico*) rostrum acute carinatum, lateribus planatis, proportio remigum alia, &c.

This is one of the most common birds in the neighbourhood

* These synonyms are mostly erroneous. The bird in question is *Edolius macrocerus*, Vieill., and not *E. balicassius*. The species *E. cærulescens*, Edw. 56, is quite distinct.—H. E. S.

of Calcutta, where it is seen all the year round. The Hindoos call it *Pingja**; the Musselmans *Boojoonga*, and the Europeans *king of the crows*. It is fond of the light of the sun, and is therefore not met with in thickly grown groves, but much oftener in open spots. I saw them often sitting together in large numbers on a small solitary tree, where they made much noise and chattered, hopped and flew about, catching insects in their flight and attacking other birds that came near. They are often seen on a meadow and among grazing cattle, on whose back they like to sit, just like starlings and jays. Like the magpie they can both walk and hop at the same time, but they are not light on foot. Even their flight is heavy, not unlike that of the magpie. Their common tone is clear or chattering; sometimes a higher *srrr! srrr!* is heard; and in April they begin to sing charmingly, something like *Sylvia trochilus*. I found their stomachs always full of insects, principally *Acheta*, which seem to be the common food for birds in Bengal.

10. *Dicrurus æneus*, Vicill.—Drongo bronze, *Levaill. Ois. Afr.* 176. *Edolius metallicus*, *Cur.*

Ater, immaculatus, viridi-æneo nitens, plumis capitis oblongis, subsquamæformibus, nitidioribus; temporibus, mento, ventrequæ nigro-opacis.

Longit. 9 poll. Rectrices mediæ 30 mill. breviores quam laterales. Rectrices laterales corpore longiores, leviter arcuato-divaricatæ, apice rotundatæ, vix attenuatæ, in ♂ 115 millim., ala 120, tarsus 15. ♀ similis mari, sed paullulum minor. Rostro et vibrissis simillimus *Muscicapæ paradisæ*. Nares setis paullo densius tectæ. Remigum 4a reliquis longior. Iris et lingua omnino præcedentis (*E. balicassii*).

Twelve or thirteen kinds of birds (which possess a remarkable external resemblance and are met with in the countries around the Indian sea) have been classified by ornithologists under one genus under the common name of Drongo, by which, according to Buffon, one of them is called in Madagascar (?). Cuvier calls them *Edolius*, and Vicillot *Dicrurus*. They have a long tail of ten feathers very much forked, rounded wings, generally of a black colour; the size of a thrush, and a great number of other resemblances. But notwithstanding these conformities, there are considerable grounds for dividing them into two generic groups, for which both the above-mentioned names can be employed. Those for which I have proposed to keep the Cuvierian name *Edolius* have their beak and feet formed as *Lanius*, and resemble

* This name is generally written *Fingah* according to Edwards, pl. 56, *Ed. carulescens*, which I have not seen in Bengal, but which seemed to me to be the young of the above species just leaving their nests: they differ in having a shorter tail and white colour under their body, on which are dark spots.

our magpies and jackdaws in their way of living; the remaining ones, which may be named by the Vieillotian name *Dicrurus*, are, as far as I know, in these respects perfectly like *Muscicapa*. By way of comparison one is reminded of almost corresponding resemblances in colour between *Turdus mindanensis*, *Bethylus leve-rianus* and our magpie, also between *Falco nisus* and *Sylvia nisoria*, &c., which yet indicate no near relationship, because important differences of form forbid it.

I saw *Dicrurus aeneus* several times in the neighbourhood of Calcutta in February and March. It remained lonely and gloomy in thick and shady groves between the branches of high trees. I never saw it on the plain. Like the *Muscicapa* it sat at times quiet and watched an opportunity to catch insects in its flight, after which it returned to the same branch; sometimes it was seen restlessly hastening away between the thick branches. I never heard any sound from this species. In its stomach were found masses of insects, namely *Achetæ*, Coleoptera, &c., but no bees, which Levaillant considers to be the principal food of this bird.

11. *Muscicapa paradisi*, Linn., Lath. no. 54.—Vardiole, Buff. Pl. Enl. 234. Tchitrec-bé, Levaill. Ois. Afr. 144, 145, 146 (ex India).

Var. a. *Pyrrhocorax*, Mœhr. *Musc. cristata alba*, Briss. *Pica papuensis*, id. sec. Seba. *Icterus maderaspatanensis*, id. sec. Ray. *Todus paradiseus*, Gm.

Var. b. *Curruca*? Mœhr. *Promerops indicus cristatus* et *Muscic. brasiliensis cristatus*, Briss. sec. Seba. *Muscic. cristatus capitis bonæ spei*, id. *Upupa paradisea*, Linn., Gm., Lath. *Muscicapa castanea*, Temm. in Kuhlî Nom. Syst. Buff.

Crista clongata, capite colloque toto nigro-æneis, limite coloris definito, recto; cauda gradata.

a. Alba, alis caudaque nigro striatis. Palpebræ coriaceæ, incras-satæ, cæruleæ (♂ Calcutta, 12 Apr. testiculis parum elatis, cauda caret plumis longissimis).

b. Cinnamomea, subtus cinerea, abdomine crissoque albidis. Ala et cauda unicolores immaculatæ. (♂ prope Ceylon, 14 Dec.) Cauda simplex; palpebræ vix incrassatæ. Jugulum obscurius cinereum, plumis paucis nigro-cæruleis.

Long. 8 poll., ala 96 mill. (in indiv. rufo 90); tarsus 18. Lingua plana, breviter triangularis, limbo membranaceo apice integro, sub-acuto. Cutis orbitæ in indiv. albo, coriacea, nuda, ut annulus latus, elevatus oculum cingit. Rostrum obscure cærulescens; pedes nigriores. Iris obscure rufescens.

This beautiful bird is perhaps commonly to be met with in India, at least it is common in our collections, and has been often described before, which appears from its many synonyms. Brisson in his 'Ornithology' has treated of it in six places under four different generic names. The reason of this arises from remark-

able dissimilarities between individuals, some being white, others a deep red brown, and of both varieties there are to be found some with soft wavy feathers in their tail, which are often twice as long as the real feathers of the tail. As I have seen no live ones except the two males above-described, which had both lost their long feathers, I can throw no light on this peculiarity; but that these individuals are of the same species might be proved by their perfect conformity in form and dimensions; for the above-described dissimilarity in the length of their wings is not always constant; one often sees somewhat larger brown and somewhat smaller white specimens. But *we cannot admit a difference in species without a certain difference in form*. It seems most likely that the brown colour is the winter plumage; that the white colour begins to appear about the commencement of the season of propagation through an organic chemical process in the feathers: the same process which so highly enhances the colour of our common birds, and causes the change in the ends of the feathers of a great number of them; also that the long feathers of the tail come to perfection in the third year or later, whilst the colour of the bird is previously brown, after which they become white with the other feathers. Both those which I shot must therefore have been younger males, which in the following year would have propagated for the first time, and have acquired the two long feathers. The change of the colour has already been pretty well proved by Levaillant, from the remarkable information he has given about a number of specimens, which he received dried from India, and among which were found some which were in the transition state between white and red-brown. He was not however aware of the fact of the existence of white males, which in spring-time lose the often-named ornament of the tail. Among the many nearly related species from Africa, there seem to be none which show similar changes of colour.

The brown male came in an exhausted state on board our vessel as she was sailing by Ceylon, about ten [Swedish] miles from the coast, and therefore out of sight of land. It had been driven out to sea the day before by a storm of rain and fog, which brought a great many birds and insects into the sea, and of which I got several. Notwithstanding its critical situation, its stomach was full of insects, and it was seen to catch several of them while flying. It sat a good hour in the rigging of the ship, after which it displayed a few times the common habit of the *Muscicapa*, to fly and catch an insect and return to its former place. The white specimen was shot in the neighbourhood of Calcutta 14th April. I pursued it a long time while it actively hastened between the branches of some high thick groves in order to catch insects. It did not manifest the slightest desire to walk on the branches, or

whilst hanging thereto to search under them, but trusted principally to its wings. From none of them did I hear sound. Its flight was uneven and jerking when bent on a longer journey. This species also is called by the Hindoos *Pingja*.

12. *Muscicapa cærulea*, Gm., Lath. no. 36; Raffles in Lin. Trans. 13; Buff. Pl. Enl. 666. 1. L'Azur, &c., Levaill. Ois. Afr. 153.

Cærulea, margine frontis anguloque menti nigris; ventre crissoque albis. Ala nigra, plumis cæruleo marginatis antice gradata. Cauda rotundata et emarginata. ♂ (Serampore 16 Febr.) læte coloratus, rostro pedibusque plumbeis, macula occipitis lincaque juguli transversis nigris. Magn. *Sylvia*. Ala 70 mill., tarsus 15, cauda 72.

♀ dorso infuscato, alis caudaque fuscis, plumis grisescente marginatis; occipite juguloque immaculatis. Jun. cinereus, ventre albido, capite margineque carpi cærulescentibus. Occiput et jugulum immaculata. Mus. Stockh.

This little beautiful bird, which is met with in the Philippine islands, Java, Sumatra, in all India and the south of Africa, I saw only once, without being able to observe it closer. It had its stomach full of all sorts of insects.

13. *Muscicapa nitida* (var. *a*)? Lath. Gen. Hist. Olivaceo-viridis, subtus flava, capite colloque cum jugulo cinereis, vertice obscuriore. Remigibus reetricibusque nigris flavescenti marginatis. Long. $4\frac{1}{2}$ poll., ala 64 millim., tarsus 14, rostrum e fronte 11. Statura, rostrum, cauda et pedes prioris. Vibrissæ majores. Ala differt: remige 1a parva, 2 et 3 gradatis, 4 et 5 æqualibus, longioribus quam reliquis (♂?).

Of this bird, of which I have seen only the specimen described, I know less than of the former*.

14. *Muscicapa* (gen. *Rhipidura*, Vig. †) *Sannio*, n. Broad-tailed Flycatcher, Lath. Gen. Hist. vi. p. 178 no. 34.

Nigro-cinereascens capite nigriori, macula oblonga superciliari, fasciaque gulari albis. Cauda longa gradata, apicibus late albis, limite transverso.

Longit. $7\frac{1}{2}$ poll., ala 80 millim.; tarsus 18, digitus medius 10, cum ungue 15; cauda 97, rostrum e fronte 12; latit. 5. Ala unicolor. Vitta ventralis parva, longitudinalis albida. Fascia gulæ lata, utrinque attenuata, sub genas producta. (♂ 7 Febr. et 3 Mart.) (In utroque testiculi tumidissimi, hepar albidum. ♀ Similis, sed individuum deperditum.)

* This is the *Cryptolopha ceylonensis* of Swainson.—H. E. S.

† Vig. et Horsf. Linn. Trans. xv. p. 246. Tres species: *flabellifera*, Lath., *rufifrons*, Lath., *molucilloides*, Vig. et Horsf. Huc porro: *M. umbellata*, n. nigro-fusca, gula, ventre, stria longiore superciliari, apicibusque reetricum albis. Ala unicolor, 77 millim., tarsus 19, rostrum e fronte 15. E Java, Mus. Gyllenkrokianum. Collum antice colore dorsi; uropygium subrufescens.

His forte affinis *Gobemouche à luncttes*, Levaill. Ois. Afr. 152?

This little charming bird I saw solitary several times in February, skulking unobserved through thick bushes. In March and April it is met with oftener, several together, close to the ground, in places very shaded, mostly in low bamboo-groves. The male spread and raised its tail, jumped about the hen-bird with its wings hanging down along the horizontal branches or bamboo-roots, and they looked very active. One often sees the parabolic-shaped white-edged tail moving about without observing the bird itself, until it announces its presence by a clear note, or turns to menace a rival in its vicinity. Its stomach is uncommonly thin, almost like a skin; it was always filled with soft insects—flies, Hymenoptera, and others. The Bengalese name given to me was *Sa-baalbaal*, which in Lath. 'Gen. Hist.' is brought under *Musc. paradisi*, where the present bird is called *Check-Dyal*, a name which I have not heard*.

15. *Muscicapa parva*, Bechst., Temm. Man.; Gloger, Eur. p. 401.

Grisca, subtus sordide alba; cauda cum tectricibus nigris, rectricibus utrinque 4, basi ultra medium albis, limite irregulari subtransverso.

♂ (Subæstivalis? testiculis parvis. Serampore 5 Apr.) colore saturatiore, capite fusciori, lateribus non canescente. Macula gulæ magna, fulva (paullo pallidior quam in *Sylv. rubecula*), undique albocincta, pectus non attingens. Ala 68 mill., tarsus 17.

Junior (♂ ♀ Febr.), caput superne colore dorsi, lateribus obsolete pallescenti maculatum. Collum antice album immaculatum. Ala 65—68 mill., tarsus 16½.

Rectrices laterales imo basi nigræ, latius in interioribus. Remiges fuscæ, intus rufescenti albidæ extus grisescenti marginatæ. Pedes et rostrum nigra. Iris obscure rufescens. Alæ et rostri forma omnino ut in *Muscicapa atricapilla*, sed ala brevior, tarsi longiores. Vibrissæ parvæ, nares membrana fornicata tectæ. Lingua brevis, integerrima, sinuato-triangularis, apice angulisque posticis subrotundatis, non membranaceo-marginatis!

This bird, which is seldom seen in Europe, seems to belong to the south of Asia. It was very common in February and March in the vicinity of Calcutta, where they lived in the same way as our *Regulus cristatus*. They came forth in large scattered flocks, hopping and climbing about the branches of trees, where they industriously collected insects, and uttered almost the very same sounds as the *Regulus*. I saw none with a yellow throat among them; they were all of the same colour. The above-described male with red yellow spots on its throat was quite alone (5th of April). For a long time I had seen none of this species, nor did I see any after that; it is therefore likely that they go to the

* This seems to be the *Rhipidura fuscoventris*, Blyth, and *R. pectoralis*, Jerdon.—H. E. S.

north during the summer. In the stomach I found the remains of winged insects (beetles), ants, &c. I have only had opportunity to compare the specimens I brought home with a single young European one, but I found a perfect conformity. The white borders on the tail however were rather different on all the specimens I have seen. The Bengalese name is *Tuntuni*, or the more correct one *Dhundhuni*, which is also used for some other common birds.

16. *Phænicornis peregrina*, Boie.—*Parus peregrinus*, Linn. *Syst. Nat.* xii. 342 (? an ♀). ♂ Mus. Carls., *Gm.*, *Lath.* *Parus malabaricus*, *Gm.*, *Lath.* ex itinere Sonnerati. *Parus coccineus*, *Gm.* *Motacilla cinnamomea*, Linn., *Gm.* *Muscicapa flammea* var. *b.* *Lath.* L'Oranor, *Levaill. Ois. Afr.* 155 (e Ceylon).

Saturate cinerea, ventre albo, remigibus apice immaculatis. ♂ genis colloque antico nigris, pectore uropygioque fulvo-aureis, rectricibus utrinque 4 valde gradatis, extrorsum oblique luteis. Alæ nigrae, vitta angulata lutea, e basi pennarum cubitalium et fascia media in primariis 6 ultimis. Long. 6 poll., ala 68 millim., tarsus 15 (Calcutta 1 Maii).

♀ seu ♂ jun. ? pallidior collo antico cum regione rostri albidis, pectore flavescenti tincto. Uropygium, fascia alarum et latera caudæ ut in mare, sed dilutiora. (Mus. Stockh.) Rostrum validum, acute carinatum. Nares membrana parva fornicata tectæ. Vibrissæ parvæ. Lingua crassa, late oblonga, planata, apice lacera, non bifida. Hæc, ut fascia alarum, pictura uropygii et laterum caudæ toti generi communia sunt.

This splendid little bird does not seem to be common about Calcutta; I saw it only once. In its actions as well as colour it bears a great resemblance to *Sylvia phænicurus*, as was even visible in the wagging of its tail. It had insects in its stomach; I heard no sound from it. The Bengalese name given me was *Pawi*.

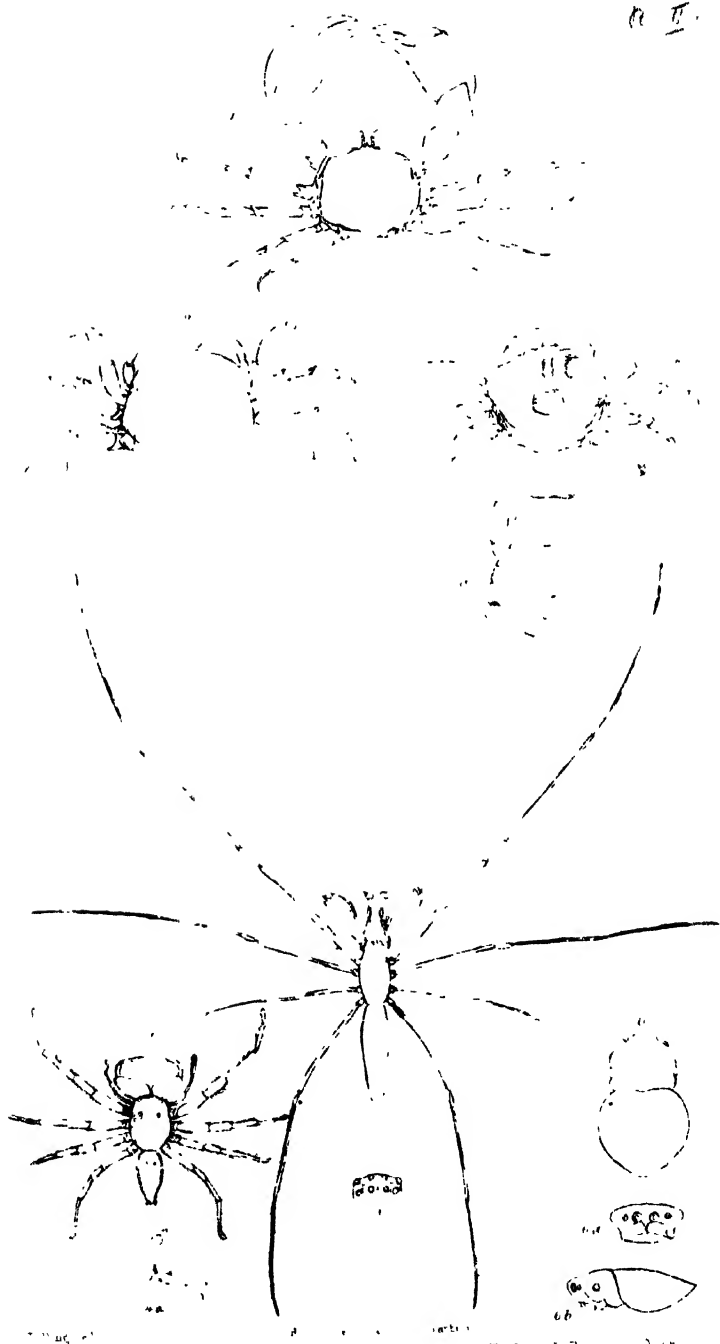
[To be continued.]

XXI. — *Notes on four new Genera of Crustacea.* By ADAM WHITE, M.E.S., Assistant in the Zoological Department of the British Museum.

[With a Plate.]

Family PINNOTHERIDÆ.

XANTHASIA, White. This genus is distinguished from *Pinnotheres* by the extreme roughness and irregularity of the upper surface of the carapace, the extreme bulging of the tail in the female, which has a wide prominent rounded keel down the middle; the legs are short and cylindrical; the claws thick, hooked and sharp-pointed. The front of the carapace projects, and on



each side of it, outside the eyes, there is a knob which makes the anterior part of the carapace angular.

Xanthasia murigera, White. Pl. II. fig. 3. Of an ochraceous white. Carapace above, with the margin, excepting in front, raised into an elevated ridge, which is curled round behind the lateral knob on the front of the carapace: on the middle of the back of the carapace there is an elevated tubercle with the lateral edges sharp and the upper surface rough; between this and the front are two parallel elevated keels placed longitudinally.

Hab. Philippine Islands. British Museum; collected by Mr. Cuming. The figure is of the natural size.

PINNIXA, White. At once distinguished from *Pinnotheres* by its carapace being much wider than long. First pair of legs with the hand more elongated; second pair of legs slender, somewhat compressed; third pair also compressed, somewhat stouter than the preceding; fourth pair very large, the third joint much thickened, behind somewhat dilated and deeply grooved near the posterior edge; the fifth or tibial joint finely serrated on the inside; last pair of legs small and of the same form as the second.

Tail of the female at the base narrowed, leaving a considerable space between its edge and the insertion of the three last pairs of hind-legs.

Pinnixa cylindrica. *Pinnotheres cylindricum*, Say, Journal of the Academy of Sciences of Philadelphia, i. p. 452.

Hab. Georgia, U. S. (on Jekyll Island). British Museum.

Family — ?

XENOPHTHALMUS, White. Carapace wider than long; the back regularly arched, rounded on the front edges; the front with a wide notch, in which are two slits, the bottom of each containing one of the eyes; eyes small, seen from above, separated from the antennæ by a somewhat cylindrical tooth which runs across the slit; front blunt; outer foot-jaws with the second joint deeply grooved on the outside, which groove extends to the basal joint; carapace on the under side hollowed out above the branchial opening, which is long and very open, the two edges furnished with long stiff hairs meeting at the end, much as in *Dorippe*.

Tail of the male 7-jointed, third joint widest, fifth joint narrowed near the base.

Tail of the female with the fourth and fifth joints of the same width; a long ciliated process proceeding from each side of the third joint.

First pair of legs of the male with the hands somewhat elongated and thickened; second pair of legs with the different joints angled, the tarsus dilated at the base and somewhat serrated on the edge; third pair of legs with the tibial joint and that

which precedes it hollowed on the fore side, the edges of the hollowed part strongly ciliated, the tarsus widened at the base and ciliated; fourth pair of legs the longest, the tarsus flattened, sides parallel and ciliated, tibial joint somewhat elongated, cylindrical; fifth pair of legs with the tarsus flattened and somewhat bent, the tibial joint short.

First pair of legs of the female very small, hands linear, ciliated; second pair much as in male, but not so robust, the tibial joint not so rough on the outside; third pair simple; fourth and fifth pairs much as in male.

Xenophthalmus pinnotheroides, White. Pl. II. fig. 2. Side of carapace in front with the sharp edge ciliated; carapace punctured; two slight waved longitudinal grooves, one extending from each eye over the back of the carapace; most of the joints of the legs ciliated.

Hab. Philippine Islands. British Museum. From the collection of Mr. Cuming. The figure is of the size of nature.

FAMILY MYCTIRIDÆ.

HALICARCINUS, White. A subgenus distinguished from *Hymenosoma* of authors (*Leachium*, MacLeay) by the great size of the thickened fore-feet, by the carapace being generally wider than long, and having the edge of the strongly depressed upper surface with two teeth or angles on each side. The four last pairs of legs are cylindrical and free from hairs, while the claws are considerably curved and compressed. The tail of the male is 6-jointed and deeply notched on each side about the middle. The outer pedipalps, as in *Hymenosoma*, are covered on the outside with short hairs.

This subgenus seems in its family a kind of representative of the *Leucosiadæ*: the type was regarded by Fabricius as a *Leucosia*.

Halicarcinus planatus, Pl. II. f. 1. *Leucosia planata*, Fabr. Ent. Syst. Suppl. 350. *Hymenosoma Leachii*, Guérin, Icon. t. 10. f. 2; Voy. de la Coquille, ii. p. 22. *Hymenosoma tridentatum*, Hombr. and Jacq. Voyage au Pole Sud, t. 5. f. 27.

This species seems to be abundant in and about the Falkland Islands. In the British Museum are specimens obtained there by W. E. Wright, Esq., and the Antarctic Expedition under Capt. Sir James Clarke Ross, R.N.

Halicarcinus depressus. *Hymenosoma depressum*, Hombr. and Jacq. Voyage au Pole Sud, t. 5. f. 34.

This species, of which there is a specimen in the collection of the British Museum from New Zealand, connects *Halicarcinus* and *Hymenosoma*, having most of the characters of the former.

XXII.—*Description of a new Genus of Arachnida, with Notes on two other species of Spiders.* By ADAM WHITE, M.E.S., Assistant in the Zoological Department of the British Museum.

[With a Plate.]

Family ATTIDÆ.

DEINERESUS, White. *Cephalothorax* ovato-rotundate, highly convex, especially in front. *Eyes* eight: four in front, the middle two very large and prominent; the lateral eyes not half the size of the middle two, and projecting; these eyes are separated by slight emarginations, the notch between the lateral and middle eyes being wider than between the two middle eyes; the fifth and sixth eyes distant from each other, very small, the space between them and the lateral eyes shorter than between them and the posterior eyes; seventh and eighth eyes of the same size as the lateral front eyes, the cephalothorax bulges over them.

Chelicera very large, swollen, attenuated at the end, with a sharpish ridge on the inside ending in a spine; hook nearly as long as the rest of the chelicere, much bent, the point also hooked with a strong tooth beneath it.

Maxillæ thick, longer than wide, excavated on the outside, entire at the end, and strongly tufted with hairs; the palpi with the second joint long and bent, the third joint slightly bent, scarcely half the length of the fourth, which is also bent, and has a spine at the end, the fifth joint thick, short, blunt at the end and very hairy.

First pair of legs the longest, femoral, genual, and tibial joints thickish; the three hind pairs nearly equal in length; the second and third with the femoral, genual, and tibial joints somewhat thickened.

This remarkable spider belongs to the group *Attidæ*, and in the matter of chelicera far surpasses even *Toxeus maxillosus*, Koch, *Arachniden*, xiii. 19. t. 436. f. 1090. I have only seen one specimen, which is a male.

Deineresus Walckenaerii, White. Pl. II. fig. 4. *Cephalothorax* and legs of a deep shining brownish black; the eyes pale, the front eyes with hairs at the base. Abdomen small, subferruginous, with short silky hairs most visible on the sides, four depressed points on the back; spinnerets prominent. Legs very hairy on the under side, a few spines among the hairs.

Total length 10 lines. Length of first pair of legs rather more than 10 lines; of second pair $8\frac{3}{4}$ lines; of third pair 8 lines; of fourth pair $8\frac{1}{2}$ lines.

Hab. Celebes. British Museum. Presented by Dr. Knapp of Edinburgh.

DEINAGNATHA, White, Dieffenb. N. Zealand, ii. 271. This subgenus of *Tetragnatha* may be distinguished by the following characters :—

Chelicera longer than the cephalothorax, narrowest at the base, with five spines at the end, the three on the upper side larger than the rest : inner edge with two rows of small teeth, the under row containing more than the upper ; the claw is very long and curved at the base, the tip is slightly bent.

Eyes eight, placed on two slightly lunated parallel lines, the two middle eyes of the anterior line nearer each other than they are to the side eyes ; they are placed on the sides and the base of a slight projection.

Maxille long, sinuated on the outer margin, dilated at the ends, which are abrupt and very slightly rounded on the angles ; palpi with the second joint very long, the third thickest at the end, and shorter than the fourth, which is hairy and considerably thickened at the end ; the globular process in the male, near the base of the fifth joint, much as in *Dolomedes mirabilis* (Clerck, Ar. Succ. t. 5. f. 4), only much more complicated.

Mentum rounded at the end, with an impressed line near the margin and extending round it ; there is a slight impressed line down the middle.

Cephalothorax of a longish oval figure, narrowed in front, depressed, with two deep impressions about the middle.

Legs long, first pair the longest, the fourth seemingly longer than the second, the third very short.

Deinagnatha Daindridgei, White, l. c. Ann. and Mag. Pl. II. f. 5. Brownish yellow, hooks of chelicera and ends of the legs darker.

Hab. New Zealand.

Mr. Joseph Daindridge or Dandridge lived about the beginning of the last century in Moorfields. Bradley, in his 'Philosophical Account of the Works of Nature,' published in 1721, refers to his having "observed and delineated a hundred and forty different kinds of spiders in England alone." In the British Museum, among Sir Hans Sloane's MSS., is a volume of Daindridge's descriptions and figures ; they are 119 in number, and are all copied by Eleazer Albin, with but little alteration and no acknowledgement, in his 'Natural History of Spiders,' published in 1786.

On Pl. II. fig. 6. is figured a spider of remarkable form sent by the Rev. D. F. Morgan from Sierra Leone ; it was described in the 'Annals and Magazine,' vol. vii. p. 476, under the name of *Homalattus pustulatus*.

XXIII.—Notice of some Genera of Cyclopæea. By J. D. DANA.

As a preface to the descriptions which follow, a classification of Crustacea is here given ; it is made out so as to exhibit to some extent the parallel relations of the several orders and subdivisions.

CRUSTACEA.

Subclassis I. PODOPHTHALMIA. Ordo 1. DECAPODA. Tribus 1. Brachyura. 2. Anomoura. 3. Macroura.	Subclassis II. EDRIOPHTHALMIA. Ordo 1. CHORISTOPODA *. Tribus 1. Isopoda. 2. Læmpoda. 3. Amphipoda.			Subclassis III. MANDYATA †.
Ordo 2. SCHIZOPODA.	Ordo 2. ENTOMOSTRACA. Subord. 1. GNATHOSTOMATA ‡. Tribus 1. Branchipodacea. 2. Linnæiacea. 3. Daphniacea. 4. Cyclopæacea. 5. Cypridacea.			Tribus 1. Cirripeda, or Balanacea ¶.
Tribus 1. Stomapoda. 2. Diplopoada.	Subord. 2. CORNOSTOMATA ‡. Tribus 1. Caligæa. 2. Lernæacea. 3. Nymphonacea.	Subord. 3. MEROSTOMATA §. Tribus 1. Lamulacea.		
	Ordo 3 TRILOBITA.			

Order ENTOMOSTRACA.

Tribe CYCLOPÆEA.

To avoid explanations in the following descriptions, we here enumerate the prominent external characters of this tribe.

Body jointed, the carapax not prolonged beyond the joint to which it belongs ; *abdomen* not inflexed.

* From *χωριστός*, *separate*, and *πούς*, *foot*, alluding to the fact that the pairs of feet belong each to a distinct segment of the body.

† From *γνάθος*, *jaw*, and *στόμα*, *mouth*, alluding to the mouth being furnished with proper mandibles and maxillæ.

‡ From *κορμός*, *trunk*, and *στόμα*, *mouth*, the mouth having the form of a moveable trunk.

§ From *μῦς*, *thigh*, and *στόμα*, *mouth*, the basal joints of the legs constituting the jaws.

|| From *μαδύη*, *a cloak*, alluding to the covering in which the body of the animal is inclosed.

¶ The Cypris-like young of several *Anatifa* were collected and figured by the writer, and the metamorphosis traced to the adult state. When first found swimming free in the ocean, they were taken for a new genus allied to *Cypris*, so similar are their forms. The fact that the body and legs of the Cirripeda shed their skin, is further evidence of the propriety of placing this group with Crustacea.

The pedicel of the *Anatifa* corresponds to a pair of antennæ in the young ; the animal attaches itself by the sucker-like disc terminating these organs before the metamorphosis commences, and in a group of *Anatifa* all the different stages may be observed, from the pair of distinct antennæ to the fixed simple pedicel.

Eyes simple.

Antennæ, two pairs ; the second often pediform or subcheliform.

Mandibles 4—5-spino-dentate, sometimes having a subnatatory palpus.

Maxillæ, one pair ; sometimes with a subnatatory palpus.

Maxillipeds, one pair ; sometimes simple maxillæ ; at others prehensile, but never at all natatory.

Feet, six pairs ; the *first* often prehensile and subcheliform, and either straight or geniculated ; *next four* pairs bifid and natatory ; the *sixth* or *posterior* (corresponding to another pair of natatories) rudimentary or obsolete, but in some genera large in the male, with the right one subcheliform.

Abdomen 2- to 6-jointed ; two caudal appendages furnished with five setæ, some of which may be obsolete ; occasionally short appendages to one or both of the first and second joints.

External ovaries, one or two, proceeding from the *second* joint of the abdomen, or what corresponds thereto.

The genera of this tribe here described may be distributed as follows :—

1. *Palpi of the mandibles and maxillæ obsolete or wanting ; eyes with simple spherical lenses.*

Family 1. CYCLOPIDÆ. External ovaries two. Eyes two, on a single spot of pigment. Abdomen abruptly narrower than the cephalothorax.

Genus 1. CYCLOPS, Müller. The two anterior antennæ subcheliform in the male. [Freshwater species.]

Family 2. ARPACTIDÆ. External ovary single. Eyes two, on a single spot of pigment. A short appendage near middle of anterior antennæ. Abdomen seldom abruptly narrower than the cephalothorax. [Marine species.]

Genus 1. ARPACTUS*, Milne Edwards. Anterior antennæ short, and both, in the male, subcheliform ; posterior pair terminating in a number of moveable setæ. Prehensile feet subcheliform.

Genus 2. SETELLA, Dana. Anterior antennæ moderately long, slender, and not subcheliform in the male ; posterior pair and prehensile feet nearly as in *Arpactus* ; short appendages to the first two joints of abdomen ; body slender, and two caudal setæ much longer than the body. [Two moveable appendages under the beak.]

* Milne Edwards has instituted the genus *Cyclopsina* for a group near *Arpactus* having the posterior maxillipeds not subcheliform. In the species examined by the writer the subcheliform character is constant, but the moveable finger is sometimes reduced to a very short hook.

The name *Setella* alludes to the *seta*-like form of the animal, and is from *seta*, a bristle.

2. *Palpi of the mandibles and of the maxillæ prominent and subnatatory.*

Family 3. CALANIDÆ. External ovary single. Eyes two, the spherical lenses on the same or separate spots of pigment. Anterior antennæ very long and slender, without an appendage. Abdomen abruptly narrower than the cephalothorax. [Marine species.]

a. *Posterior thoracic legs rudimentary or obsolete, without appendages. Anterior antennæ alike in the two sexes, and never with a geniculating joint.*

Genus 1. CALANUS, *Leach*. Cephalothorax 4-jointed. Anterior antennæ multiarticulate, with the front margin neatly setiferous, and also the posterior apices of the three terminal joints; first pair of feet much larger than the maxillipeds, having outward lateral motion, but scarcely prehensile; maxillipeds very short and straight, setigerous; abdomen short, 2- to 4-jointed. Beak furcate.

Genus 2. SCRIBELLA, *Dana*. Cephalothorax 4-jointed. Anterior antennæ long, 7-jointed; setæ long and pointing in different directions. Maxillipeds much larger than the first pair of legs, flexed forward, the three terminal joints as long as the basal and setigerous, the setæ setulose. Abdomen very long (as long as the cephalothorax); two setæ to the short basal joint (a plume or capillary appendage to the base of the eight natatory legs extending outward at right angles with the body).

Genus 3. ACARTIA, *Dana*. Anterior antennæ few-jointed; setæ long and pointed in different directions; maxillipeds much larger than the first pair of legs, not flexed, having the terminal joints very short and setigerous, nearly as in the genus *Pontella*; the first pair of legs small and short, not prehensile; the posterior thoracic legs, a single small joint bearing two divergent setæ, one quite long and usually standing out from the body.

The name *Acartia* is from *ἀκαπτος*, *unshorn*, alluding to the long divaricate hairs of the antennæ.

b. *Posterior thoracic legs very long and nearly equal; antennæ of the two sexes alike, without a geniculating joint.*

Genus 4. EUCHIRUS, *Dana*. Anterior antennæ many-jointed, with several long setæ at intervals; first pair of feet much larger than the maxillipeds, very long and doubly geniculate, the apex flexed downward and furnished below with a pencil of naked setæ; motion of these organs forward in the line of the body, and not

outward. Posterior thoracic legs in male very long, and the right one subcheliform. Beak pointed, in lateral view emarginate.

c. Posterior thoracic legs in the male large, the two unequal, and the right subcheliform; the right one of the anterior antennæ in the same sex having a geniculating joint about one-third its length from the apex.

Genus 5. PONTELLA*. Anterior antennæ multiarticulate, the setæ as in *Calanus*. Maxillipeds much larger than the first pair of legs, not flexed, and having the terminal joints short and setigerous, the setæ extending forward to the mouth and setulose, as in *Acartia*; the first pair of legs small and short, not prehensile. The right posterior thoracic leg in the male large cheliform, the left smaller and often simple. Beak furcate. Caudal setæ more or less spread. [There is a large glassy appendage under the head, with a rounded or reniform summit.]

Genus 6. CANDACIA, Dana. Anterior antennæ and posterior thoracic legs nearly as in *Pontella*; the first pair of legs much larger than the maxillipeds, elongate and flexed forward, with the extremity inflexed and bearing a pencil of long naked setæ, motion in the line of the body. Front truncate; caudal setæ usually not spread. Colour often in part black or nearly so.

3. *Palpi of the mandibles and maxillæ obsolete; two simple eyes?; also two oblate lenses in the front, and two prolate lenses posterior to these within, which may constitute another pair of eyes.*

Family 4. CORYCÆIDÆ. Tentacles short, few-jointed; external ovaries two.

Genus 1. CORYCÆUS†, Dana. Body not depressed. Abdomen abruptly narrower than the body, 2- or 3-jointed; second pair of antennæ subcheliform, larger than the first pair of legs (nearly as in the genus *Ergasilus*).

Genus 2. ANTARIA, Dana. Similar to *Corycæus*, but having the second pair of antennæ terminating in a few movable setæ,

* The name *Pontia*, applied to this group by Milne Edwards, was previously applied to a genus of insects, and has therefore been changed as above. The genus *Cetochilus* of Roussel de Vauzème does not differ essentially from *Pontella*.

† See Proceed. of Acad. Nat. Sci. of Philad. for October 1845, p. 285. The two lenses in these animals are separated by an unobstructed space, and appear beyond doubt to serve for the transmission of light. In contact with the posterior lens behind is an oblong spot of dark pigment. The only other supposition with regard to their nature which I can suggest, is their possible connection with phosphorescence. But such an arrangement for this end is not probable; and moreover I was never satisfied that the species were phosphorescent.

and smaller than the first pair of legs. [I am not satisfied that these specimens are not the female of the *Corycæi*.]

Genus 3. SAPPHIRINA, Thompson. Body much-depressed; antennæ as in *Corycæus*; abdomen 5- or 6-jointed, the basal joint in the female abruptly narrower than the thorax, and having a pair of short appendages; external ovaries two.

Family 5. MIRACIDÆ. Antennæ as in *Setella*; external ovary single.

Genus 1. MIRACIA, Dana. Body not depressed, nearly as in the *Arpactidæ*; the abdomen 5- or 6-jointed and not abruptly narrower than the thorax; anterior antennæ nearly as in *Setella*, with a short appendage near the middle; second pair of antennæ terminating in a few moveable setæ; beak with two cultriform appendages; first pair of legs subcheliform.

The distinctions in the above genera rest to a considerable extent upon the use of different organs for grasping in the union of the sexes. In *Cyclops* and *Arpactus*, both anterior antennæ of the male are subcheliform for this purpose; in *Pontella* and *Candacia* the right antenna and right posterior thoracic leg are thus modified in the male; in *Euchirus* both posterior thoracic legs are very much elongated; in *Calanus* the first pair of legs are long, and have an outward lateral motion for the purpose; in *Corycæus* the second pair of antennæ subserve this end, and in *Antaria* the first pair of legs are large and subcheliform; in *Setella* the same end appears to be secured by the first pair of natatories.

The genera of *Calanidæ* differ also in the relative development of the maxillipeds and first pair of legs. In *Pontella*, *Acartia* and *Scribella* the maxillipeds are largest. In *Pontella* and *Acartia* they are straight, with long setulose setæ directed forward so as to form a kind of scoop-net. In *Scribella* they are flexed like the letter L. In *Calanus*, *Euchirus* and *Candacia* the first pair of legs are larger than the maxillipeds; in *Calanus* they are long and spread outward laterally; in *Euchirus* they are thrown forward in the line of the body, and are flexed like the letter \angle ; and in *Candacia* they have nearly a similar position, but have the extremity flexed towards the head instead of away from it.

The maxillipeds may always be distinguished from the first pair of legs by the setæ, which are setulose in the former and naked in the latter*.

* This article, for the communication of which we are indebted to the author, has also been published in Silliman's American Journal for March 1846.—ED.

PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

February 17, 1846.—E. Forster, Esq., V.P., in the Chair.

Mr. Ward exhibited specimens of the extreme states of *Chondrus crispus*, Lyngb., gathered by him at Linmouth, N. Devon, growing within a few feet of each other, but under different conditions; the broad variety being found in pools among the rocks, where it is always submersed; the narrow on the outer ledge of rocks, where it is fully exposed to the action of the waves, which produce the same effect upon it as is frequently observed in freshwater aquatics, the submersed leaves of which become more or less finely divided, in proportion to the greater or less rapidity of the stream. It is worthy of remark, that the broad state, which is found in comparatively still water, is wholly free from zoophytes, while the narrow is entirely coated with them.

Read some observations "On the Axial and Ab-axial arrangement of Carpels." By T. S. Ralph, Esq., A.L.S. &c.

Mr. Ralph begins by referring to the differing position of the odd sepal pointed out by Mr. Brown as constituting a character of ordinal value between *Leguminosæ* and *Rosaceæ*, and to the uniform position of the solitary carpellum in the former, and endeavours to determine, either hypothetically or from actual observation, the relation of carpella to axis in various families and genera of plants. He notices a specimen of *Heracleum giganteum*, in which three mericarps were developed, and states that in each case the additional mericarp was placed side by side with the ab-axial (or anterior) mericarp, from which circumstance he concludes the axial (or posterior) to be in this case the odd carpellum. In a specimen of an *Oenothera* with five instead of four carpella, he found the fifth carpellum apparently ab-axial. He conjectures from the position of the abortive stamen in *Scrophularinææ*, that the odd carpellum is in that family ab-axial; and in other cases, such as *Lychnis* for example, he endeavours to determine its position by means of the odd style. He refers the arrangement of carpella in relation to axis to four heads; viz. definite, 1. axial or centripetal, 2. ab-axial or centrifugal; indefinite, 3. anterior and posterior, 4. right and left. In the two latter cases the position must be determined theoretically. He concludes by giving a list of genera examined by himself, and arranged under the heads of carpels "axial," and "ab-axial."

Read also a continuation of Dr. Boott's "*Caricis Species Novæ v. minus cognitæ*." In this, the third part of his paper, Dr. Boott describes seventeen species, the characters of which are as follows:—

1. C. RARA, spicâ simplici oblongâ fuscâ androgynâ apice masculâ, stigmatibus 3, perigyniis ovatis acuminatis rostratis ore emarginatis crebrè et validè nervosis divergentibus squamâ ovatâ obtusâ v. acutiusculâ ferrugineâ longioribus.

Hab. in Mont. Khasiya Indiæ Orientalis, *Griffith in Herb. Lemann.*

Obs. C. *polytrichoides*, Muhl. affinis.

2. *C. ESENBECKII*, spicâ cylindricâ diotcâ? v. androgynâ apice masculâ multiflorâ basi laxiflorâ fœmineis paucioribus alternis instructâ, stigmatibus 2, perigyniis (floriferis) linearibus ore membranaceo truncato oblique fissis ciliato-serratis squamâ lanceolatâ hispidio-mucronatâ angustioribus longioribusque.

C. trinervis, Nees in Wight, *Contr. Ind. Bot.* (non Decand.)

Hab. in Indiâ Orientali, Moura, *Ityle*. In Monte Chûr, ad alt. ped. 12,000, *Edgeworth*.

3. *C. GEYER*, spicâ simplici androgynâ apice masculâ basi flosculis fœmineis 1 v. 2 alternis instructâ, stigmatibus 3, perigyniis triquetro-obovatis stipitatis rostratis ore integro glabris pallidis squamâ latâ basi amplectente brevi-cuspidatâ dorso trinervi pallidâ ad latera ferrugineâ brevioribus angustioribusque.

Hab. in declivitatibus aridis Montium Saxosorum, Americæ Septentrionalis, *C. A. Geyer*, no. 332 (*Herb. Hook.*).

Obs. Affinis *C. phyllostachys*, Meyer, quæ flosculis fœmineis sæpè 3, squamis masculis brevioribus apice hyalinis, fœmineis foliaceis longissimis, rachi flexuosâ, differt.

4. *C. COACTA*, spicâ castaneâ basi setaceo-bracteata e spiculis pluribus androgynis apice masculis parvis ovatis sessilibus ebracteatis in capitulum longiusculum arcuè congestis compositâ, stigmatibus 2, perigyniis ovatis acuminato-brevi-rostratis bifidis stipitatis utrinque sub-9-nerviis supernè ad margines bialatas serrato-scabris stramineis squamâ ovatâ hispidio-mucronatâ brevioribus.

Hab. in Afghanistan, *Griff.*, no. 79 (*Herb. Hooker*).

Obs. Affinis *C. vulpinæ*, L.; differt culmo obtusangulo, supernè gracili, nec in axim angustiore abruptè coarctato. A *C. vulpinari*, Nees, spicâ longâ cylindricâ basi minùs compositâ (nec ovatâ), perigyniis scabris, distincta. A *C. glomeratâ*, Thunb. culmo graciliori obtusangulo, perigyniis sub-9-nerviis, spicâ congestâ (nec basi sublobatâ), bractea solùm ad basin spicæ setacæ, foliis angustioribus (nec glaucescentibus) differt.

5. *C. SANGUINEA*, spicâ decompositâ duplicato-racemosâ; racemis terminalibus axillaribusque remotis solitariis geminatisque longè exsertè pedunculatis vaginatis; spiculis 3—8 ovatis sessilibus atro-purpureis androgynis apice masculis ad apicem pedunculorum spicatim v. duplicato-spicatim dispositis, stigmatibus 3, perigyniis trigono-ovatis rostratis bifidis nervosis stipitatis scabris subrecurvis squamâ latâ ovatâ acutâ v. mucronulatâ purpureâ longioribus.

β. magis composita (junior).

Hab. in Afghanistan, *Griffith*, no. 96. β, No. 91 (*Herb. Hook.*).

Obs. Ad gregem *C. polystachyæ*, Willd. &c. pertinet.

6. *C. RAFFLESIANA*, spicâ ferrugineâ concolori subsesquipedali paniculatâ e spiculis permultis congestis sessilibus oblongis androgynis apice masculis supra-decompositâ; paniculis terminalibus axillaribusque multifloris: superioribus sessilibus approximatis simplicibus solitariis: inferioribus remotis longè pedunculatis decompositis geminatis vaginato-bracteatis, stigmatibus 3, perigyniis trigono-ellipticis acuminatis longè rostratis oblique recurvis bidentatis nervosis supernè plùs minùs scabriusculis ad margines serrato-scaberrimis lineolis purpureis notatis squamâ ovatâ uninervi ferrugineâ mucronatâ longioribus.

Hab. in Ins. Java, *Horsfield*.

Obs. Affinis *C. raphidocarpæ*, Nees, quæ perigynio glabro subciliato, squamâ subulato-acuminatâ, foliis subtùs margineque hirtis, differt. A *C. ramosâ*, Schk., *C. flicinâ*, Nees, *C. meigynâ*, Nees, inflorescentiâ densiore aliisque notis differt.

7. *C. PRESCOTTIANA*, spicis 6 elongatis cylindricis approximatis stramineis concoloribus: terminali 1 v. 2 masculâ: reliquis fœmineis sessilibus nutantibus evaginatibus inferioribus longè foliaceo-bracteatis basi laxifloris, stigmatibus 2, perigyniis lato-ellipticis brevi-rostratis bidentatis compressis nervosis divergentibus stramineis squamâ hispidomucronatâ dorso trinervi pallidâ ad latera ferrugineâ latioribus longioribusque.

Hab. in Nâpaliâ? *Herb. Wallich.*, no. 3386.

Obs. Affinis *C. crinitæ*, Lam.

8. *C. JUNCEA*, spicis 2—4 gracilibus erectis ferrugineo-purpureis: terminali masculâ filiformi: reliquis fœmineis laxifloris subremotis infimâ pedunculatâ evaginatâ, stigmatibus 3, perigyniis triquetro-fusiformibus ore integro apice scabris squamâ ovatâ obtusâ longioribus vel lanceolatum mucronatam subæquantibus.

C. juncea, *Willd. Enum. Suppl.* p. 63; *Kunth, Cyper.* p. 168.

C. miser, *Buckley in Sillim. Journ.* 45. p. 173.

C. Rugeliana, *Kunze in Herb. Hooker* (ex parte).

Hab. in Montibus Carolinæ Septentrionalis, *Buckley, Rugel.*

Obs. Affinis *C. brachystachys*, Schk. quæ perigyniis foliis infimis vaginisque glabris, &c. differt.

9. *C. OLIVACEA*, spicis 6—8 elongatis cylindricis alternis remotis: masculis ferrugineis 2: fœmineis 4 v. 5 rariùs 6 apice masculis fusco-olivaceis longissimè bracteatis infimâ remotâ rariùs inclusè pedunculatâ, stigmatibus 3, perigyniis ellipticis acuminato-rostratis bidentatis ventricosus nervosis rugosis divaricatis squamâ lanceolatâ hispido-aristatâ brevioribus latioribusque.

Hab. in Assam Indiæ Orientalis, *Major Jenkins (Herb. Hooker).*

Obs. Habitus *C. pendulæ*, Huds.

10. *C. GRIFFITHII*, spicis 4 v. 5 purpureis: terminali masculâ obovatâ: reliquis fœmineis oblongo-cylindraceis inferioribus exsertè pedunculatis basi attenuatis erectis, stigmatibus 3, perigyniis ovalibus tenuissimis abruptè brevè-cylindrico-rostratis ore integro v. emarginato membranaceo enerviis margine supernè scabriusculis purpureis basi albidis compressis squamâ lanceolatâ acuminatâ longè cuspidatâ purpureâ nervo albo angustioribus brevioribusque.

Hab. in Affghanistan, *Griffith*, no. 78 (*Herb. Hooker*).

Obs. Affinis *C. lucida*, Boott.

11. *C. SULLIVANTII*, spicis 4—6 cylindricis gracilibus: masculâ 1: fœmineis 4 rariùs 3—5 laxifloris erectis pedunculatis superioribus approximatis infimâ remotâ exsertè pedunculatâ basi attenuatâ sæpè compositâ, stigmatibus 3, perigyniis ellipticis brevi-rostratis ore integro v. emarginato viridibus pellucidè punctatis pilosis enerviis squamâ ovatâ ciliatâ hispido-mucronatâ albidâ nervo viridi paululùm longioribus.

C. Sullivantii, *B. Bot. Exc. to the Mount. of N. Carol.* Gray in *Sillim. Journ.* 42. p. 29.

Hab. in sylvaticis prope Columbiam Ohionis, Americæ Septentrionalis, *W. S. Sullivant* (1840).

Obs. Affinis *C. arclatæ*, Boott, satis herbâ pilosâ, spicis erectis, perigyniis enerviis distincta.

12. *C. ACUTATA*, spicis 5 v. 6 erectis cylindraceis fuscis: masculâ 1 v. 2 sessilibus: reliquis 4 fœmineis sæpè apice subulato-acutatis masculis densifloris sessilibus vel pedunculatis longè foliaceo-bracteatis alternatim contiguas, stigmatibus 3, perigyniis elliptico-lanceolatis rostratis

bifurcatis subinflatis nervosis glabris nitidis squamâ purpureo-ferrugineâ concolori v. apice hyalinâ ciliatâ hispido-aristatâ longioribus.

C. physocarpa, Nees (non Presl).

Hab. in America Meridionali; in Ins. Chiloe, Cuming, no. 43; in Monte Pilylum Columbiae, ad alt. ped. 12,000, Jameson (*Herb. Hooker*).

Obs. Affinis *C. paludosæ*, Gooden.

13. *C. THECATA*, spicis 4—6 erectis pallidis v. castaneis: terminali masculâ cylindraceâ: reliquis fœmineis oblongis remotis inferioribus exsertè pedunculatis longè bracteatis vaginatis, stigmatibus 3, perigyniis (floriferis) ovatis bidentatis utrinque nervosis ad margines denticulatis squamâ ovatâ acuminatâ v. cuspidatâ dorso nervosâ brevioribus.

Hab. in arenosis Insulæ Rottneest prope Prest, Preiss., 1839 (*Herb. Ward.*); ad fl. Cygnorum, Drummond, no. 921 (*Herb. Hooker*).

Obs. Affinis *C. alveata*, Boott; differt perigyniis bidentatis margine denticulatis.

14. *C. TUCKERMANI*, spicis 5 v. 4 rariùs 6: masculis 2 rariùs 3 v. 1: fœmineis 3 v. 2 oblongis cylindraceisque crassis subapproximatis pedunculatis longissimè bracteatis infimâ sæpè demùm nutante, stigmatibus 3, perigyniis tenuibus pellucidis oblongo-ovatis acuminatis longè cylindrico-rostratis bifurcatis glabris turgidè inflatis pallidis oblique adscendentibus 10—14-nerviis squamâ ovatâ acutâ v. hispido-mucronatâ multùm latioribus longioribusque.

C. bullata, Tuckerman, *Enum. Method. Car.* p. 20 (non Schkuhr).

Hab. in America Septentrionali, "nondum in Novâ Angliâ visa," Tuckerman.

Obs. Affinis *C. bullata*, Schk. Differt perigyniis tenuioribus pellucidis majoribus oblique adscendentibus, rostro glabro, squamis sæpè mucronatis, spicis fœmineis pluribus longioribus longius pedunculatis nutantibus, foliis latioribus, culmo scabriori, pedunculis scabris.

15. *C. SPICULATA*, spicis 4 v. 5 cylindraceis pallidis erectis androgynis apice masculis superioribus approximatis sessilibus infimâ subremotâ exsertè pedunculatâ, stigmatibus 3, perigyniis triquetro-ellipticis cylindrico-rostratis bifidis stipitatis supernè ad margines scabris nervosis squamâ lanceolatâ acuminatâ v. hispido-cuspidatâ longioribus.

Hab. in Montibus Khasiya Indiae Orientalis, Griffith (*Herb. Lemann*).

Obs. Affinis *C. setigera*, Don (*C. hymenolepis*, Nees), quæ perigyniis scabris, squamis testaceis, spicis supremis masculis differt.

16. *C. MOORCROFTII*, spicis 3 v. 4 ovalibus congestis: terminali masculâ: reliquis fœmineis v. apice masculis infimâ pedunculatâ lanceolato-bracteâ, stigmatibus 3, perigyniis ovali-globosis rostratis bifidis enerviis nitidis glabris v. supernè ad margines hispidulis pellucidè punctulatis stramineis rostro purpurascente longè stipitatis squamâ lanceolatâ acutâ fusco-purpureâ apice marginibusque albo-membraceâ brevioribus.

Hab. in Indiâ Orientali, ad ripas fl. Indi in planitie elatâ Tibetanâ, "Tibet-Grass of Moorcroft," Falconer in litt. ad Prof. Royle.

Obs. Affines *C. verna*, Schk., *C. conglobata*, Kit. Differt spicis congestis nunc apice masculis evaginatis, bractæ abbreviatâ, perigyniis enerviis bifidis pellucidè punctatis, foliis glauco-viridibus demùm flavis.

17. *C. TENUSSIMA*, spicis 2 v. 3 erectis pedunculatis: terminali masculâ cylindricâ: reliquis fœmineis oblongis laxè paucifloris exsertè pedunculatis vaginatis remotis, stigmatibus 3, perigyniis trigono-obovatis brevissimè conico-rostratis rostro recto ore emarginato leviter nervosis squamam æquilatam mucronatam ferrugineam æquantibus.

C. panicea? Bunge in *Herb. Fielding*.

Hab. in Chinâ Boreali, Bunge.

Obs. Affinis C. paniceæ, L., satis foliis filiformibus, squamis fœmineis mucronatis, perigynii rostro recto, distincta.

March 3.—Edward Forster, Esq., V.P., in the Chair.

Read a paper "On the Aqueous Vapour, and on the dark colour of the Wax, in Bee-hives." By George Newport, Esq., F.R.S. &c. Communicated by the Secretary.

The author directs attention in this paper to the transpiration of vapour from the interior of bee-hives at certain seasons of the year, an occurrence which, he remarks, has almost escaped the observation of naturalists. He also recalls to the notice of the bee-keeper that at the latter end of summer there is often a deposit of dark-coloured matter on the foot-stool, or on the alighting-board at the entrance-hole of the hive, extending a few inches from it. This deposit the author at first believed to be occasioned by shattered pollen or by rejected excrementa, but he was afterwards convinced that it does not arise from either of these causes. He believes it is occasioned by small quantities of wax, which, adhering to the feet of the bees when they leave the combs, become deposited on the floor at the entrance as the bees leave the hive; and the darkened colour which this deposit acquires he thinks is due to the same cause as that which changes the appearance of the combs in the interior. This, he suggests, may depend on some chemical effect produced in the wax by the respired air of the hive. Part of the carbonic acid which necessarily results from the respiration of the bees on the combs may become chemically combined with the wax, composed, as it actually is, of nearly eight-tenths of its whole weight of carbon, and it may thus acquire the darkened colour from the surcharge of its chief constituent, the affinity being promoted by the elevated temperature of the hive.

In the autumn, when a hive is examined early in the morning, after the bees have been in a state of activity during the preceding day, and more especially when the temperature of the preceding night has been low, there is often a quantity of fluid draining from the entrance-hole. The amount of this is dependent on the greater or less degree of activity of the bees, and consequently of their respiration and of the transpiration from their bodies.

Huber stated that the interior of the hive is ventilated by the *fanning* of the bees with their wings. This observation the author has confirmed; and he suggests the probability, that it is to the meeting of the two currents of introduced and expelled air, occasioned by this act of the bees, that the deposition of the vapour as fluid is due.

In order to ascertain the quantity of vapour condensed and expelled from a hive, he made experiments, which, as he remarks, although not free from objection, yet afford some indication of the amount. He cut off the bottom of a glass phial, and then accurately fitted the phial to the entrance-hole of a box-hive, in such a manner that both the expelled and the introduced air passed through it. During one night of nearly twelve hours, at the commencement of September, there was condensed within the phial nearly one drachm

and a half of fluid. The temperature of the external atmosphere, when the hive was examined at seven o'clock in the morning, was 59° F., and that of the hive, at some distance within the entrance, 69° F.

On another occasion, a few days afterwards, at about the same time in the morning, when the temperature of the atmosphere was 61° F., that of the vapour within the phial as it issued from the hive, but at nearly four inches' distance from it, was 71°·5 F., while the interior of the upper part of the hive, as ascertained by a thermometer inserted through the top and undisturbed for several days, was only 69° F. The bees were then quiet at the top of the hive, but were in activity at the lower part. The temperature of the hive and the quantity of fluid thus seemed to depend on the amount of respiration consequent on the greater or less activity of the bees, as the author has shown respecting temperature in the 'Philosophical Transactions' for 1837.

On another occasion, when the bees were quiet and the temperature of the external atmosphere was only 41° F., that of the top of the hive was 54° F., but that of the vapour from the entrance-hole was 59° F. The quantity of fluid then condensed in the phial, during a night of twelve hours, was scarcely three minims.

These experiments seemed to show that the vapour is in the greatest quantity when the bees are most active, and in the least quantity when they are inactive; and the author believes that it is the carbonic acid, the result of respiration, and held in solution in this vapour, which occasions the darkened colour of the combs.

March 17.—The Lord Bishop of Norwich, President, in the Chair.

Read a paper "On the Siliceous Armour of *Equisetum hyemale*, L., with an account of its hitherto undescribed Stomatic Apparatus." By Golding Bird, A.M., M.D., F.R.S., F.L.S. &c.

Dr. Bird commences his paper by referring to the observations of Mr. Sivright on the large amount of silica contained in *Equisetum hyemale*, and those of Dr. Brewster on the general arrangement of the siliceous masses on its surface and their action on polarized light. He then proceeds to describe minutely the structure of this siliceous armour. The fourteen longitudinal ridges on each joint of the stem are each furnished with two parallel rows of siliceous tubercles, having the lustre and general appearance of glass beads; and along the margins of each ridge are numerous longitudinal wavy lines, which fill up the intervals between the lateral aspects of the ridges and the centres of the contiguous furrows. In the depressions of these furrows is seen a double vertical series of oval projections, arranged in pairs, each furnished with an oval fissure, having its longer axis placed transversely; these fissures lead to the complex stomatic apparatus.

Dr. Bird details the manipulations, consisting of maceration in water, boiling in strong nitric acid, careful scraping away of the disorganized cellulo-vascular structure, washing, boiling again in nitric acid, and again washing in water, which he considers neces-

sary for the perfect exhibition of the minute structure of the stomata. After a portion of the stem has undergone these processes, the siliceous structures previously observed become much more obvious and distinctly marked. On reversing the preparation so as to obtain a view of its inner surface, the portions corresponding to the rows of tubercles are found to be nearly opaque, owing to a compact series of linear masses of siliceous matter combined with some still remaining organic structure. Equidistant from these linear masses are seen the posterior aspects of the stomatic apparatus, each presenting an ovate nipple-like prominence having its longer axis corresponding with that of the stem, and consequently opposed to that of the external fissure, into the base of the conical eminence surrounding which these ovate bodies are fitted.

Further manipulation is necessary to carry this investigation into the more minute details; and Dr. Bird has recourse to heat, applied by holding the piece of *Equisetum* prepared as already described in the flame of a spirit-lamp, in order to get rid of the minute portion of organic matter still remaining in the preparation. After acquiring a red heat, the preparation finally assumes a snowy whiteness; it is then placed between two slips of glass, which reduce it by breaking into fragments of a size sufficiently small to allow of careful examination by high powers of the microscope. The transverse fissure leading externally to the stomatic apparatus is found to have been widened and rendered irregular by the heat. On bringing this fissure within the focus, it is seen to be replaced by one having its longer axis in the opposite direction, which is derived from the oval figure of the apparatus at its base. Among the fragments may be seen numerous separated specimens of the stomatic apparatus. This is described by Dr. Bird as oval in outline, nearly flat, and measuring in its long diameter $\frac{1}{16}$ th of an inch. It consists of a frame of siliceous matter formed of two pieces, thick at their convexities, thin at their concavities, nearly touching above and below, and grasping between them two long and flat structures, fissured (apparently) in a pectinate manner, and tapering from their middle towards either end. In most specimens an opening exists between these structures; in others they are quite in contact. In some the thinner and laminated portions of the frame are perforated by three well-defined apertures, but this is by no means constant. The apparatus thus consists essentially of four pieces, viz. two curved frames with their laminae and two linear pectinated structures; and these are placed at the base of a conical eminence opening by a transverse fissure. By what means it is retained in its position Dr. Bird has not been able satisfactorily to ascertain.

April 7.—Edward Forster, Esq., V.P., in the Chair.

Read a "Note on the Generation of *Aphides*." By George Newport, Esq., F.R.S., Fellow of the Royal College of Surgeons, &c.

In this note the author states his object to have been the verification by his own observations of those made by Leeuwenhoek, Bonnet, Reaumur and others, preparatory to attempting hereafter to show

the accordance of those observations with some universal law of reproduction. The points to which his attention was more particularly directed were, first, whether the *Aphis* is really viviparous at one season and oviparous at another; and secondly, whether the supposed ova are true eggs, or, as some have imagined, merely capsules designed for the protection of the already-formed embryos during the winter season.

On the 30th of November Mr. Newport observed the deposition of the egg by the female *Aphis*, and found it to be a true egg, similar to that of other insects, composed of an orange-coloured yolk, formed of yellow nucleated cells, surrounded by a very small quantity of transparent vitelline fluid, and containing a very large germinal vesicle with a distinct macula or nucleus. On the 2nd of December the females were again seen to produce living young, and Mr. Newport describes the process of parturition which he then observed. These observations confirm the statements of former naturalists on both the points inquired into, and negative the presumption raised with reference to the capsular character of the egg by proving it to possess all the characters of a true ovum.

April 21.—Edward Forster, Esq., V.P., in the Chair.

Mr. Ward, F.L.S., exhibited specimens of the dried plant and fruit of *Uncaria procumbens*, Burchell, from South Africa; and also a portion of the stipes of a fern from New Plymouth, New Zealand, probably belonging to *Pteris esculenta*, Sol., measuring several feet in length. Mr. Carrington, from whom the latter specimen was obtained, stated that the species of fern from which it was obtained grows, in the neighbourhood of the coast, to the height of five feet, in masses of from six to seven feet diameter, so strong and dense as to be capable, if a cover were thrown over it, of sustaining the weight of a man. On the margin of the bushland it attains a height of twenty-one feet, and Mr. Carrington has observed it on the banks of a river, when interlaced and matted together, to measure thirty feet.

Read a paper "On the Development of Starch and Chlorophylle." By Edwin John Quekett, Esq., F.L.S. &c.

Mr. Quekett commences by referring to the observations and opinions of Müller, Münter and Nägeli on the subject of the formation of starch and chlorophylle in the cells of plants, and to his own observations, recorded in the 'Pharmaceutical Journal,' vol. iii. 1843-44, on the growth of starch in the leaves of *Vallisneria spiralis*. Müller, he states, has observed that in the cells of *Chara crinita*, the cyto-blast becomes hollow, enlarges, and fills the cell-membrane in which it is contained, and ultimately becomes the reservoir for granules of starch; while Nägeli has observed that in *Caulerpa prolifera*, at the period of the formation of starch, the cells contain several smaller cells, in each of which are developed generally from three to four grains of starch. In order to observe the growth of starch and chlorophylle, Mr. Quekett examined in several plants the organs in which

those substances are generally situated, and found that their formation took place, in the majority of instances, in the following manner.

In the very young stem of *Circea Lutetiana*, or the young branch of the Grape-Vine, the different appearances presented by the grains of starch from their perfect state down to their first commencement may be readily observed by making numerous sections from the lowermost internode up to the terminal joint. The cells most recently formed are so filled with mucilage and granules as to be opaque; lower down the granules begin to disappear and the cytoblast is apparent; still lower the cytoblast appears to have lost its granular character without having much increased in size, and has become a minute cell with a distinct nucleus, instead of a congeries of granules with a larger central one. On the *outside* of this nucleated cell, granules (varying in number from ten to twenty) make their appearance, at first very minute and of a green hue, and afterwards enlarging and becoming colourless; and as they increase in size the nucleated cell is absorbed and the granules become free. At a later period a multiplication of the granules takes place by fission and pullulation, certain grains exhibiting marks of subdivision, and others having minute granules attached to them; and generally more grains of starch are found in a cell than the number of minute granules seen developing on the nucleus.

Several of these stages are more readily seen in the tuber of the Potato. If a slice be removed from its exterior so thin as only to pass beneath the cuticle, and a very thin and perfectly transparent slice be then taken and examined under the microscope, the cells in the central portion are seen to contain only a few grains of starch, while in approaching the sides of the section the grains become smaller and pass gradually into the nature of chlorophylle. On directing attention to those parts of the section, in which the cell-contents pass gradually from the state of starch to that of chlorophylle, many cells are seen to contain a distinct nucleated cell, apparently of a flattened or lenticular form, on the edge of which are arranged a number of minute granules; in others the appearances are more advanced, the granules gradually becoming larger and the nucleated cell becoming obliterated. From the disturbance that takes place in the position of the granules after detachment from the nucleated cell, it is difficult to determine by what part they were adherent to it; but Mr. Quekett believes that this adherence takes place at the end at which the point or hilum is observed. Subsequent to this period the grains of starch enlarge, become laminated, and are multiplied in the manner already pointed out by various observers.

Such are the results of Mr. Quekett's observations on Exogenous plants; in Endogenous plants he states that the same process does not appear to be in all cases pursued, inasmuch as while the rhizoma of *Iris germanica* affords a favourable example for the exhibition of the process as above described, the young stem of *Lilium bulbiferum* offers the following differences. Sections taken from the base of a young stem within the bulb have their cells full of starch-grains; at

the height of an inch from the base of the stem, the cells are filled with fluid only, and each cell contains a cytoblast with its contents presenting a milky hue. Carrying on the sections from above downwards within these limits, the cells are first found to become more transparent and to contain granules with well-defined outlines; lower down they exhibit minute granules mixed with the fluid of the cell, leaving the cytoblast transparent, empty and angular; while at the base the granules have arrived at their perfect condition and the cytoblast is no longer visible. Thus it appears, Mr. Quekett states, that there are two modes of formation of starch connected with the cytoblast; in the one case the cytoblast becomes a nucleated cell and the grains originate on its exterior; in the other it does not become a nucleated cell, but gives origin to the grains in its interior.

As regards the origin of chlorophylle, Mr. Quekett states that in the plants which he has examined the same mode of development appears to obtain as described in the formation of starch, viz. the granules originating from a nucleated cell, and instances the cuticle of the *very* young frond of *Scolopendrium vulgare*, L., as an example; but he adds that the first origin of chlorophylle is so mixed up with the formation of the cell, that it is impossible to arrive by dissection at the commencement of the process.

May 5.—The Lord Bishop of Norwich, President, in the Chair.

Read a letter "On the Migration of the Swallows," addressed to the Secretary. By Thomas Forster, Esq., M.D., F.L.S. &c., dated Bruges, May 2nd, 1846.

The object of this note is to show, not only that the four British species of Swallows migrate, but also that their migration is progressive through Europe to Asia and Africa. The first table is stated to have been compiled from the recorded observations of naturalists and others, copied on the spot during an extensive tour through Europe in the years 1833, 1834, 1835 and 1836. Dr. Forster states that he is satisfied that numerous flights of the several species annually arrive at the end of February and beginning of March in Sicily, Italy and the Islands of the Mediterranean, from Africa. Of these a portion proceed after a few days' rest towards the north, leaving colonies in different places as they advance, until they reach their most northern destination in Europe. In autumn they retire in the same manner, and their numbers appear prodigiously increased in particular places where they halt and rest for days before the phalanx again takes wing. This, Dr. Forster states, is also the case with Quails, with the Mountain-Finch, and with many of the Warblers. Particular places seem to be favourite resorts as resting-places to particular species, as Pisa for example to the Swift, the Campagna and Southern Italy to the Martin. When an early spring has occurred in the S. of Europe, these birds have made their appearance earlier, as if they had been capable of inferring an earlier season northwards.

TABLE I.
Mean time of Arrival.

Species.	Naples.	Rome.	Pisa.	Vienna.	Bruges.	London.
<i>Hirundo rustica</i>	Feb. 27	March 3	March 5	March 25	April 5	April 15
<i>H. urtica</i>	April 10	April 15	April 16	April 20	May 1	May 1
<i>H. riparia</i>	April 3	April 5	April 8	April 12	April 25	April 25
<i>H. Apus</i>	April 15	April 18	April 20	April 25	April 30	May 3

In their recession in autumn they observe nearly the same relative times, with the exception that the Swifts migrate much earlier in Flanders than they do in Kent and Sussex. They are often gone on the 1st of August, and always about the 5th, whereas they remain in England until about the 15th.

The second Table is copied from the Journal kept in succession by Dr. Forster's late father, T. F. Forster, Esq., F.L.S., and himself; and records the period of arrival of the Swallow (*Hirundo rustica*, L.) for nearly half a century. Dr. Forster hopes on a future occasion to supply similar tables of the Martin, Swift, and other birds of passage.

TABLE II.

Showing the day of Arrival of the Swallow for forty-seven years.

1800, April 15	1812, April 15	1824, April 14	1836, April . 6
1801, — 5	1813, — 15	1825, — 19	1837, — 6
1802, — 15	1814, — 19	1826, — 14	1838, — 13
1803, — 15	1815, — 14	1827, — 22	1839, — 15
1804, — 17	1816, — 21	1828, — 23	1840, — 15
1805, — 5	1817, — 10	1829, — 21	1841, — 5
1806, — 2	1818, — 17	1830, — 16	1842, — 5
1807, — 15	1819, — 15	1831, — 12	1843, — 21
1808, — 16	1820, — 16	1832, — 19	1844, — 16
1809, — 18	1821, — 18	1833, — 17	1845, — 8
1810, — 20	1822, — 17	1834, — 1	1846, — 1
1811, — 18	1823, — 22	1835, — 7	

Read also a note "On the Structure of *Viola*, in connection with its Impregnation." By T. S. Ralph, Esq., A.L.S. &c.

Mr. Ralph regards the following circumstances as more or less essential to the impregnation of the ovules of *Viola*: 1st, the pendent position of the flower, which brings the stigma into a position below the anthers; 2ndly, the spurred petal, which by the secretion of honey attracts insects, whose efforts to obtain a supply of nutriment disturbs the whole band of coherent anthers through the movements impressed on the two spurs of anthers which descend into the nectary, and thus cause a free discharge of pollen; 3rdly, the rostrate termination of the stigma in some species, in which the pollen is shed very freely and appears to have a ready access to the interior of the stigma; 4thly, the remarkable bend in the style in those species which have a globose stigma, in which species Mr. Ralph has also found a set of singular hairs seated on the claw of the fifth or

spurred petal, on which the pollen collects very abundantly, and thence probably finds its way into the interior of the stigma; the stigmatic head being readily capable of being pushed into the groove of the claw of the petal amid these hairs, a process which Mr. Ralph thinks is performed by the assistance of insects. In some species there are also a set of hairs placed at the throat of the corolla on the two middle petals, the use of which Mr. Ralph thinks to be to shut out the ingress of the proboscis of the insect in that direction.

ZOOLOGICAL SOCIETY.

July 14, 1846.—Wm. Yarrell, Esq., Vice-President, in the Chair.

Mr. Lovell Reeve read a paper containing "Descriptions of forty new species of *Haliotis*, from the collection of H. Cuming, Esq.":—

The genus *Haliotis* affords an unusual abundance of novelty, from the circumstance of it never having been selected for the subject of an illustrated monograph; the species are, moreover, well-defined, and may be easily determined by a careful examination of the variations of sculpture and arrangement of colours.

The *Haliotides* are interesting in form as being the most evolved and depressed of spiral shells, and they have been arranged with the Chitons and Limpets as exhibiting the nearest apparent affinity with the non-spiral Gastropods. They present also a singularity of structure in great measure analogous to the orifice in the shell of *Fissurella* or to the fissure in *Emarginula*. On the left side of the shell, in a direct curve parallel to the inflexed edge, is a row of equidistant perforations, made by the animal in its progress of growth for conveying the water to the breathing organs; the mantle is slit in that direction to a certain extent, and the water passes into the respiratory cavity through a tubular filament protruding from each hole. The number of pallial filaments being alike in the same individual throughout its several stages of growth, the shell mostly presents the same number of holes at all ages, filling up the hindmost orifice as a new one becomes formed at the margin. The *Siliquaria* presents a similar modification of structure, and it has been also considered that the slit in *Pleurotoma* is in some measure analogous.

The internal surface of the 'Ear Shells' is lined with a bright pearly nacre, which in most species is of remarkable iridescent brilliancy, glowing with all the colours of the rainbow; the attention must, however, be directed to the outer coating of the shell, for the discrimination of species, and it is with this view that the figures in the foregoing monograph are devoted mainly to external sculpture. There is certainly a striking variation of character in the nacre of different species, but the pattern of the inner surface is merely an indentation of the outer. The number of perforations varies in different species, but may be said to correspond in different individuals of the same species; where an exception occurs, it is that there is sometimes one, or at most two, less in the adult than in the young state; that is, when the animal arrives at maturity it continues to stop up one or two of the perforations in advance of any new one.

It is a curious circumstance in the geographical distribution of the *Haliotides*, that few, if any, are to be found where Chitons abound; as if they exchanged places to a certain extent in the two hemispheres. There are a few species from California, but along the western coast of South America, where Chitons are most abundant, not any are found, and only one small species, the *H. pulcherrima*, at any of the islands of the Pacific. They inhabit the coasts of China, Japan, Ceylon, Mozambique, Cape of Good Hope, Borneo, and the Philippine Islands; but the greater number of species, and the most remarkable, are from New Zealand and the continent of New Holland, displaying all the peculiarity of design which invariably characterizes the fauna of those isolated regions. With the well-known *Haliotis tuberculata* of the Channel Islands, all are familiar. It is, however, a circumstance worth noting, that although such near neighbours, and comparatively abundant, especially at the island of Jersey, it is rarely collected on the coast of England.

The *Haliotides* are found at low water, attached to the under surface of masses of stone, and they fix themselves with great force to the rocks, by suction, on the least alarm.

HALIOTIS SPLENDENS. *Hal. testâ ovatâ, convexo-depressâ, undique spiraliter liratâ, liris crebris regularibus subobtusis, nonnullis aliis latioribus; foraminibus quinis perviis, extus ærugini-viridescente, articulis albicantibus prope spiram interdum notatâ, epidermide fibroso fusco indutâ, intus cæruleo viridique, nigricante nebulatâ, pulcherrimè iridescente.*

Hab. California.

HALIOTIS JAPONICA. *Hal. testâ ovato-oblongâ, subplanulato-convexâ, liris tenuibus æqualibus spiraliter funiculatâ, concentricè rugoso-plicatâ, plicis conspicuis lamellaformibus irregularibus; foraminibus quinis senisve perviis; luteo olivacco-fusco viridique undique pulcherrimè variegatâ.*

Hab. Japan; Dr. Siebold.

HALIOTIS COCCINEA. *Hal. testâ oblongo-ovatâ, spiraliter liratâ, liris creberrimis inæqualibus interstitiis transversim minutissimè striatis; foraminibus confertiusculis, quinis senisve perviis; extus coccineo-rufâ, lutescente-albo maculatâ et variegatâ, intus argenteo-albicante.*

Hab. Cape de Verd Islands.

HALIOTIS ZICZAC. *Hal. testâ ovatâ, planulato-convexâ, spiraliter subtilissimè sulcatâ, foraminibus parviusculis, senis perviis; olivaceo-viridi, luteo-viridescente obliquè flammeo-undatâ, apice luteo-aurantio tinctâ, intus argentea, iridescente.*

Hab. Calipan, island of Mindoro, Philippines (found on smooth stones); Cuming.

HALIOTIS MULTIPERFORATA. *Hal. testâ oblongo-ovatâ, subflexuosâ, anfractuum parte spirali subelevatâ; spiraliter lineari-sulcatâ, sulcis subundatis irregularibus; foraminibus parviusculis numero-*

sis, decemis perviis; extus nigricante-fusco viridique variegatâ, intus albicante.

Hab. — ?

HALIOTIS DISCUS. *Hal. testâ oblongo-ovatâ, elevato-convexâ, hic illic tumidâ et rugosâ, latere sinistro lato, peculiariter erecto; foraminibus amplis, subdistantibus, tubiferis, quaternis tantum perviis; castaneo-fuscâ, viridi aut rufescente radiatim tinctâ.*

Hab. Japan; Dr. Siebold.

HALIOTIS SIEBOLDII. *Hal. testâ subobliquè ovatâ, subpectinatâ, valdè convexâ, apice terminali, vix spirali; radiatim liratâ, liris obtusis, subdistantibus; foraminibus subamplis, quinis perviis; extus aurantio-rubrâ, intus albicante, iridescente.*

Hab. Japan; Dr. Siebold.

HALIOTIS SQUAMATA. *Hal. testâ oblongo-ovatâ, convexâ, spiraliter liratâ, liris creberrimis, squamatis, alternis majoribus; foraminibus octonis perviis; fuscâ et rubro-fuscâ, flammulis lutescentibus undatis ornatâ, intus vividè iridescente.*

Hab. North-west coast of Australia; Dring, H.M.S. Beagle.

HALIOTIS FUNEBRIS. *Hal. testâ ovatâ, subdepresso-convexâ, spiraliter liratâ, liris subsquamatis, hic illic majoribus, transversim peculiariter rugoso-plicatâ; foraminibus octonis aut novenis perviis; rubido-castaneâ, interdum viridi tinctâ, flammis perpauca indistinctis circa spiram.*

Hab. New Holland.

HALIOTIS DIVERSICOLOR. *Hal. testâ ovatâ, subplanulatâ, spiraliter liratâ, liris obtusis irregularibus, transversim leviter plicatâ; foraminibus octonis vel novenis perviis; castaneo-fusco coccineorufâ viridique radiatâ, maculis undatis lutescentibus variegatâ.*

Hab. New Holland.

HALIOTIS COCCORADIATA. *Hal. testâ suborbiculari, ovatâ, plano-convexâ, medio leviter depressâ, spiraliter subtiliter liratâ, liris striis minutis elevatis decussatis, foraminibus senis perviis; flavidd, strigis latis vividè coccineis radiatim pictâ.*

Hab. — ?

HALIOTIS VIRIDIS. *Hal. testâ ovatâ, depresso-convexâ, obliquè undato-rugatâ, spiraliter liratâ, litarum interstitiis striatis, foraminibus quinis perviis; extus albicante, viridè pulcherrimè tinctâ et marmoratâ, intus argenteâ.*

Hab. — ?

HALIOTIS ASTRICATA. *Hal. testâ ovatâ, convexâ, spiraliter liratâ, liris laminis striisque elevatis irregularibus radiatim decussatis; foraminibus quaternis perviis; extus albidd, olivaceo viridique marmoratâ, intus iridescente.*

Hab. — ?

HALIOTIS TAYLORIANA. *Hal. testâ oblongo-ovatâ, solidiusculâ, convexâ, spirâ subterminali, spiraliter obtusè et irregulariter*

liratâ; foraminibus septenis ad novenis perviis; extus coccineofuscâ, flavido, coccineo-fusco maculato, prope spiram, nebulatâ; intus albicante.

Hab. — ?

Named in honour of my worthy friend Thomas Lombe Taylor, Esq., of Starston, Norfolk.

HALIOTIS RUBIGINOSA. *Hal. testâ ovatâ, subdepresso-convexâ, radiatim plicato-rugosâ, spiraliter lirâtâ, liris obtusè squamatis, foraminibus subapproximatis, senis perviis; extus rubiginoso-aurantiâ, spiraliter albi-strigatâ, intus argentatâ.*

Hab. — ?

HALIOTIS RUGOSA. *Hal. testâ ovatâ, convexâ, medio leviter depressâ, radiatim plicato-rugosâ, spiraliter lirâtâ, liris obtusis, hic illic majoribus; foraminibus subamplis, quaternis perviis; extus olivaceo-fusco viridique marmoratâ.*

Hab. — ?

HALIOTIS ROSACEA. *Hal. testâ ovatâ, convexo-depressâ, spiraliter crebriliratâ, liris striis exsculptis undique decussatis; foraminibus peculiariter oblongo-ovatis, quaternis perviis; extus corallo-rubro et roseo-albicante marmoratâ, rubro viridi punctatâ.*

Hab. — ?

HALIOTIS PERTUSA. *Hal. testâ oblongo-ovatâ, spiraliter posticè subtilissimè sulcatâ, sulcis pertusis, anticè exiliter lirâtâ, sulcis lirisque subirregularibus et undatis; foraminibus senis perviis; extus rufo-fuscâ, strigis perpauca lutescentibus undatis prope spiram, intus vividè iridescente.*

Hab. — ?

HALIOTIS PLANILIRATA. *Hal. testâ ovatâ, plano-convexâ, spiraliter lirâtâ, liris planulatis irregularibus; foraminibus quinis perviis; olivaceo- et cœruleo-viridi.*

Hab. — ?

HALIOTIS SCUTULUM. *Hal. testâ convexâ, spirâ depressâ, subocculatâ, spiraliter exiliter lirâtâ, liris planulatis, undulatis, hic illic majoribus; foraminibus senis perviis; olivaceo-fuscâ, viridi pulcherrimè articulatâ, punctatâ et maculatâ.*

Hab. — ?

HALIOTIS ZEALANDICA. *Hal. testâ oblongo-ovatâ, subdepressâ, spiraliter irregulariter sulcatâ, liris intermediis obtusis, nunc latis, nunc angustis, senis perviis; rufo-castaneâ et albicante peculiariter marmoratâ.*

Hab. New Zealand.

HALIOTIS SPECIOSA. *Hal. testâ oblongo-ovatâ, plano-convexâ, medio depressâ, spiraliter elevato-striatâ, striis confertis; foraminibus senis perviis; coccineo-rufâ albo-nigricante marginatâ, pulcherrimè variegatâ.*

Hab. — ?

HALIOTIS RETICULATA. *Hal. testâ oblongo-ovatâ, anticè subattenu-*

atâ, plano-convexâ, medio depressâ, latere sinistro latiusculo, erecto, spiraliter vix striatâ; foraminibus quaternis perviis; sordidè fuscâ, maculis albidis reticulatis subtriangularibus ornatâ.

Hab. — ?

HALIOTIS NEBULATA. *Hal. testâ oblongo-ovatâ, convexâ, spirâ subelevatâ, spiraliter sulcatâ, sulcis parvis, undatis; foraminibus subapproximatis, septenis perviis; fusco roseoque undique nebulatâ.*

Hab. — ?

HALIOTIS SPICULATA. *Hal. testâ ovatâ, spiraliter peculiariter lirâtâ, liris angustis, erectis, valdè irregularibus, radiatim undato-plicatâ; foraminibus amplis, senis perviis; olivaceo-viridi, hic illic albipunctatâ.*

Hab. — ?

HALIOTIS SEMISTRIATA. *Hal. testâ ovatâ, spiraliter subtiliter lirâtâ, radiatim undato-plicatâ et plus minusve tuberculosâ; foraminibus subtubiferis, quinis perviis; fuscâ aut coccineo-rufâ, albi-maculatâ.*

Hab. Ceylon; Dr. Sibbald.

HALIOTIS CLATHRATA. *Hal. testâ semicirculari-ovatâ, spiraliter crebrilirâtâ, interstitiis striis subtilissimè clathratis, radiatim plicatâ; foraminibus subamplis, quinis perviis; viridi et vividè rufo variegatâ.*

Hab. Bacayon, island of Bohol, Philippines; Cuming.

HALIOTIS STOMATÆFORMIS. *Hal. testâ oblongo-ovatâ, valdè convexâ, spiraliter striatâ, radiatim subtiliter plicatâ, spirâ subterminali, elevatâ; foraminibus quinis perviis; olivaceo viridique marmoratâ.*

Hab. New Zealand.

HALIOTIS ANCILE. *Hal. testâ ovatâ, regulariter convexâ, spiraliter exiliter noduloso-striatâ, nodulis interdum subobscuris interruptis; foraminibus numerosis, parvis, octonis perviis; olivaceo-viridi, nodulis et circa spiram cupreo-roseis.*

Hab. — ?

HALIOTIS DRINGII. *Hal. testâ orbiculari-ovatâ, spiraliter striatâ, radiatim plicatâ et tuberculosâ; foraminibus subtubiferis, quaternis perviis; extus pallidè viridescente-luteâ, medio conspicuè coccineo tinctâ, intus argenteâ.*

Hab. North coast of Australia.

HALIOTIS CONCINNA. *Hal. testâ suboblongo-ovatâ, spiraliter striatâ, medio leviter tuberculatâ, obliquè subobsecrè plicatâ; foraminibus quaternis perviis; carneo-albicante, coccineo-roseo profusè variegatâ.*

Hab. Zamboanga, island of Mindanao, Philippines; Cuming.

HALIOTIS GEMMA. *Hal. testâ suborbiculari-ovatâ, plano-convexâ, latere sinistro latiusculo, spiraliter subtuberculatâ, radiatim pulcherrimè minutè plicato-squamatâ; foraminibus subtubiferis, quaternis quinisque perviis; flavescente, coccineo viridique tinctâ.*

Hab. — ?

HALIOTIS LAUTA. *Hal. testâ ovatâ, anticè attenuatâ, undato-tumidâ, spiraliter lirâtâ, liris subtilibus, confertis, striis minutis decussatis; foraminibus subamplis, quinis perviis; rubido et flavescents-albidâ irregulariter marmoratâ.*

Hab. Swan River Settlement, New Holland; Lieut. Preston.

HALIOTIS PAPULATA. *Hal. testâ suborbiculari-ovatâ, spiraliter obtuso-lirâtâ, liris subdistantibus, conspicuè tuberculatis; foraminibus subtubiferis, quaternis perviis; corallo-rubrd, flavescents varidâ.*

Hab. North coast of Australia; Dring.

HALIOTIS JACNEENSIS. *Hal. testâ oblongo-ovatâ, spiraliter peculiariter rudè lirâtâ, liris valdè irregularibus, subquamosis, prope foramina sublævigatâ; foraminibus subtubiferis, distantibus; rufescente-aurantiâ, intus argenteâ.*

Hab. Jacna, island of Bohol, Philippines.

HALIOTIS PUSTULATA. *Hal. testâ oblongo-ovatâ, spiraliter obscure lirâtâ, tuberculis parvis pustulatâ, radiatim plicatâ; foraminibus senis perviis; albidâ viridique marmoratâ.*

Hab. — ?

HALIOTIS AQUATILIS. *Hal. testâ oblongo-ovatâ, plano-converâ, medio depressâ, lævigatâ, prope marginem peculiariter plicatâ; foraminibus senis perviis; pallidè viridi, albido aut flavescents undato-variegatâ, intus albicante.*

Hab. Kurile Islands, south of Kamtschatka.

HALIOTIS JANUS. *Hal. testâ oblongo-ovatâ, spiraliter lirâtâ, liris subtilibus angustis, interstitiis excavatis; foraminibus senis perviis; luteo-aurantiâ, fasciâ latâ albidâ, fusco grandimaculatâ, prope foramina ornatâ.*

Hab. — ?

HALIOTIS CRUENTA. *Hal. testâ ovatâ, anticè subattenuatâ, spirâ elevatusculâ, spiraliter peculiariter undato- et corrugato-striatâ; foraminibus subapproximatis, octonis perviis, sanguineo albipunctato et albido sanguineo-punctato pulcherrimè variegatâ.*

Hab. New Zealand.

HALIOTIS INCISA. *Hal. testâ ovatâ, medio subdepressâ, spiraliter incisâ, subtuberculiferâ; foraminibus amplis, quaternis perviis; albidâ et purpureo-viridi marmoratâ, albido minutissimè rufo-punctatâ.*

Hab. — ?

The next paper was also communicated by Mr. Lovell Reeve, and contained "Descriptions of fifty-four new species of *Mangelia*, from the collection of H. Cuming, Esq.":—

The *Mangelia* are nearest allied to those aberrant species of *Pleurotoma* in which the predominant character of that genus, the fissure in the upper extremity of the lip, becomes modified into a somewhat obscure sinus. Their general aspect is that of a more or less fusiform *Marginella*, without plaits or polished exterior; distinguished, on the other hand, by a row of faint wrinkle-like denticulations on the

inner surface of the lip and columella, and a gutter-like sinus in the lip at its junction with the body-whorl.

MANGELIA SICULA. *Mang. testâ subfusiformi, spirâ acuminatâ, anfractibus rotundatis, gibbosiusculis, concentricè costatis, lævibus; aperturâ brevi, ovatâ, sinu subconspicuo; intus extusque castaneo-fuscâ, labro flavicante, fusco-lineato.*

Hab. Sicily.

MANGELIA VEXILLUM. *Mang. testâ oblongo-ovatâ, anfractibus supernè depressis, nodosis, costis e nodis descendentibus, superficie totâ decussatim striatâ, quasi subtilissimè decussatâ; aurantio-luteâ, fasciis albicantibus angustis undique cingulatâ.*

Hab. Ilo Ilo, isle of Panhay, Philippines (found under stones); Cuming.

MANGELIA LYRA. *Mang. testâ trigono-fusiformi, anfractibus supernè angulatis, longitudinaliter costatis, costis subobliquis, ad angulum incrassatis; castaneo-fuscâ, lineis albicantibus decussatis, labro albicante.*

Hab. Island of Ticao, Philippines (found on the sands); Cuming.

MANGELIA ANTILLARUM. *Mang. testâ subpyriformi-ovatâ, lævigatâ longitudinaliter concentricè costatâ, costis fortibus, subobtusis distantibus; cinereo-carnæâ, costis fasciâ rubidâ tinctis, labro albicante, rubido fasciatim tincto.*

Hab. West Indies.

MANGELIA MARGINELLOIDES. *Mang. testâ pyriformi-ovatâ, spirâ brevi, acutâ; anfractibus supernè angulatis, longitudinaliter multicostratis, costis tenuibus, crebris, suturis descendentibus; lacteo-cæruleâ aut cinereo-fuscâ, lineis rubidis cingulatâ, anfractûs ultimi parte supra angulum maculâ grandi nigricante conspicuè tinctâ.*

Hab. Island of Burias, Philippines (found in sandy mud at the depth of seven fathoms); Cuming.

MANGELIA FUNICULATA. *Mang. testâ trigono-fusiformi, subelongatâ, anfractibus supernè depressis, longitudinaliter tenuicostatis, lævibus; cinereo-fuscâ, costis labroque albicantibus.*

Hab. Islands of Ticao and Masbate, Philippines (found on the sands); Cuming.

MANGELIA CAVERNOSA. *Mang. testâ oblongo-ovatâ, spirâ angulato-turritâ; anfractibus supernè angulatis, intra costis cavernosis, costis fortibus, obtusis, suturis descendentibus; albâ, aurantio-fusco hic illic sparsim maculatâ.*

Hab. Island of Ticao, Philippines (found on the sands); Cuming.

MANGELIA CYLINDRICA. *Mang. testâ cylindræo-fusiformi, apice acutâ, longitudinaliter subtiliter costatâ, transversim elevato-striatâ; pellucido-albâ, fuscescente tinctâ, aurantio-fusco infra suturas maculatâ.*

Hab. Cagayan, island of Mindanao, Philippines (found in sandy mud at the depth of twenty-five fathoms); Cuming.

MANGELIA CAPILLACEA. *Mang. testâ ovato-fusiformi; spiræ suturis profundis; anfractibus supernè depressis, transversim subtilissimè et creberrimè elevato-striatis, longitudinaliter costatis, angustis, suberectis, supernè leviter mucronatis; fuscescente, lineis subtilibus fuscescentibus zonatâ.*

Hab. Island of Burias, Philippines (found among coarse sand at the depth of seven fathoms); Cuming.

MANGELIA GRACILIS. *Mang. testâ gracili-fusiformi, transversim subtilissimè striatâ, longitudinaliter costatâ, costis angustis; albâ, castaneo-fusco indistinctè zonatâ et maculatâ.*

Hab. Island of Ticao, Philippines (found under stones at low water); Cuming.

MANGELIA LAMELLATA. *Mang. testâ fusiformi-ovatâ, spiræ suturis profundis, subcavernosis, anfractibus transversim elevato-striatis, striis fortibus, subdistantibus, longitudinaliter costatis, costis angustis, erectis, lamellæformibus, supernè leviter mucronatis; albâ, fusco pallidissimè zonatâ.*

Hab. Isle of Burias, Philippines (found among coarse sand at the depth of seven fathoms); Cuming.

MANGELIA VITTATA. *Mang. testâ oblongo-ovatâ, subconicâ, spirâ brevi, obtusâ; anfractibus longitudinaliter costatis, costarum interstitiis striis fortibus clathratis; albâ, olivaceo-fusco latifasciatâ, costarum parte olivaceo-fusâ albipunctatâ.*

Hab. Island of Ticao, Philippines (found on the sands); Cuming.

MANGELIA ZONATA. *Mang. testâ abbreviato-fusiformi, spirâ breviusculâ, turrâ suturis profundis; anfractibus longitudinaliter costatis, costis e suturis descendentibus; lævigatâ; albâ, zonâ conspicuâ aurantio-fusâ cingulatâ.*

Hab. Island of Ticao, Philippines (found on the sands); Cuming.

MANGELIA INTERRUPTA. *Mang. testâ oblongo-ovatâ, spirâ brevi, anfractibus supernè nodosis, costis e nodis descendentibus; albâ, lineis nigris subtilissimis transversis interruptis, creberrimè dispositis, inter costas ornatâ.*

Hab. Island of Ticao, Philippines (found on the sands); Cuming.

MANGELIA RETICULATA. *Mang. testâ fusiformi-ovatâ, spirâ breviusculâ, apice acuminatâ; anfractibus supernè perpendiculariter compressis, deinde tumidiusculis et longitudinaliter costatis, costarum interstitiis exiliter fusco-punctatis.*

Hab. Island of Ticao, Philippines (found on the reefs); Cuming.

MANGELIA FULCHELLA. *Mang. testâ fusiformi-ovatâ, subcylindraceâ, spirâ breviusculâ, apice acuminatâ; anfractibus supernè rotundatis, longitudinaliter multicostatis, costis tenuibus gracilibus, concentricè dispositis, anfractuum superficie totâ exilissimè reticulatâ; luteo-albicante, maculis quadratis parvis rufis costarum interstitiis fasciatim cingulatâ.*

Hab. Island of Ticao, Philippines (found on the sands); Cuming.

MANGELIA FUSIFORMIS. *Mang. testâ fusiformi, anfractibus su-*

pernè subangulatis, ad angulum nodosis, costis tenuibus subsuperciliariis e nodis descendentibus, transversim creberrimè striatis; luteo-albicante, punctis perpaucis aurantio-fuscis tinctis.

Hab. Island of Corrigidor, Philippines (found among coarse sand at the depth of ten fathoms); Cuming.

MANGELIA LYRICA. *Mang. testâ fusiformi, utrinque acuminatâ, anfractibus longitudinaliter concentricè costatis, transversim elevato-striatis; fuscescente, aurantio-fusco pallidè et indistinctè fasciatâ.*

Hab. Island of Burias, Philippines (found among coarse sand at the depth of seven fathoms); Cuming.

MANGELIA GIBBOSA. *Mang. testâ ovato-conicâ, spirâ brevissimâ; anfractibus supernè gibbosis et nodulosis, longitudinaliter costatis, lævigatis; cinereo-albicante, lineis aurantio-fuscis exilibus cingulatâ, dorso supernè nigricante tincto.*

Hab. Island of Ticao, Philippines (found on the reefs); Cuming.

MANGELIA MACULATA. *Mang. testâ subfusiformi, basi truncatâ, longitudinaliter costatâ, costis tenuibus subdistantibus, concentricè dispositis; sinu latiusculo; albâ, maculis subquadratis aurantio-fuscis inter costas.*

Hab. Island of Ticao, Philippines (found under stones at low water); Cuming.

MANGELIA TURRICULA. *Mang. testâ fusiformi-turritâ, suturis profundis; anfractibus plano-depressis, longitudinaliter concentricè costatis; albicante, lineis subtilissimis aurantio-fuscis obsolete cingulatâ.*

Hab. Island of Ticao, Philippines (found on the sands); Cuming.

MANGELIA COLUMBELLOIDES. *Mang. testâ ovatâ, spirâ brevi, acutâ; anfractibus supernè leviter rotundatis, transversim elevato-striatis, longitudinaliter tenuicostatis, labro medio tumido, intus fortiter denticulato; nived, costis eximie aurantio-fusco punctatis.*

Hab. Baclayon, island of Bohol, Philippines (found on mud banks); Cuming.

MANGELIA CONOHELICOIDES. *Mang. testâ ovato-conicâ, spirâ brevissimâ, acutâ; anfractibus transversim elevato-striatis, longitudinaliter multiliratis, liris tenuibus, ante suturas evanidis; luteo-albicante, dorso maculâ grandî aurantio-fusâ interdum tincto.*

Hab. Daleguete, isle of Zebu, Philippines (found under stones); Cuming.

MANGELIA TENEBROSA. *Mang. testâ subfusiformi, spirâ acuminato-turritâ; anfractibus supernè plano-depressis, suturis profundis, transversim striatis, longitudinaliter costatis, costis distantibus; intus extusque castaneo-fusâ.*

Hab. Cagayan, island of Mindanao (found in sandy mud at the depth of twenty-five fathoms); Cuming.

MANGELIA NOVA HOLLANDIÆ. *Mang. testâ ovatâ, infernè attenuatâ, subconicâ, spirâ brevi; anfractibus supernè rotundatis, lon-*

gitudinaliter obliquè costatis; livido-cinereis, apice basique nigricantibus, labro albido, apertura fauce fuscis.

Hab. Swan River.

MANGELIA LIVIDA. *Mang. testâ subfusiformi-ovatâ, apice acuminatâ; anfractibus longitudinaliter concentricè costatis, costis tenuibus; livido-carnèis.*

Hab. Island of Ticao, Philippines (found on the reefs); Cuming.

MANGELIA ABYSSICOLA. *Mang. testâ oblongo-ovatâ, utrinque conspicuè attenuatâ, longitudinaliter costatâ, lineis elevatis cingulatâ; albidd, fusco zonatâ.*

Hab. Island of Mindanao, Philippines (found in sandy mud at the depth of twenty-five fathoms); Cuming.

MANGELIA BICOLOR. *Mang. testâ oblongâ, concentricè costatâ, costarum interstitiis subtilissimè striatis; supra albidd, infra plumbed.*

Hab. Island of Ticao, Philippines; Cuming.

MANGELIA FUNEBRIS. *Mang. testâ oblongâ, concentricè costatâ, costarum interstitiis lævibus; albidd fasciatâ plumbed latâ cingulatâ.*

Hab. Island of Ticao (found under stones at low water); Cuming.

MANGELIA STROMBOIDES. *Mang. testâ fusiformi-ovatâ, spirâ subturritâ; anfractibus supernè angulatis, longitudinaliter costatis, costis ad angulum nodosis, interstitiis subtilissimè striatis; albidd.*

Hab. Island of Bohol, Philippines.

MANGELIA PALLIDA. *Mang. testâ ovatâ, concentricè costatâ, costis subobtusis; albâ.*

Hab. Island of Ticao, Philippines; Cuming.

MANGELIA PESSULATA. *Mang. testâ cylindraceo-oblongâ, spirâ breviusculâ, longitudinaliter eximè subobliquè costatâ, costarum interstitiis subtilissimè striatis; nived.*

Hab. Philippine Islands; Cuming.

MANGELIA RIGIDA. *Mang. testâ ovatâ, longitudinaliter fortiter tuberculato-costatâ, transversim subtilissimè striatâ; fuscescente.*

Hab. Ægean Sea; Forbes.

MANGELIA ELEGANS. *Mang. testâ oblongâ, spirâ breviusculâ, acuminatâ, anfractibus supernè angulatis, longitudinaliter costatis, costis angustis, ad angulum mucronatis, costarum interstitiis pulcherrimè elevato-striatis; lutescente-albâ, exilissimè fusco-zonatâ.*

Hab. Island of Mindoro, Philippines; Cuming.

MANGELIA LINEATA. *Mang. testâ ovatâ, spirâ acuminatâ; concentricè obtuso-costatâ, lævigatâ; carneo-fuscescente, lineis saturatioribus undique cingulatâ.*

Hab. — ?

MANGELIA PLANILABRUM. *Mang. testâ fusiformi, utrinque acuminatâ, lævissimâ, anfractibus supernè depressis, longitudinaliter*

costatis; labro planulato, supra subangulato; cinereo-purpurascen-
cente, albizonato.

Hab. Island of Ticao, Philippines; Cuming.

MANGELIA HORNBECKII. *Mang. testd ovatd, spirid breviusculd,*
acutd, suturis profundis, subcavernosis, longitudinaliter costatd,
costis prominentibus, transversim subtilissimè striatd, albd.

Hab. Island of St. Thomas, West Indies; Dr. Hornbeck.

MANGELIA CASTANEA. *Mang. testd oblongd, spirid acuminatd, con-*
centricè tenuicostatd, costarum interstitiis striatis; castaneo-
fuscd.

Hab. Island of Burias, Philippines; Cuming.

MANGELIA PUSILLA. *Mang. testd fusiformi-ovatd, lævigatd, lon-*
gitudinaliter costatd, costis solidiusculis obtusis; albidâ, castaneo
copiosè tinctâ et lineatâ.

Hab. — ?

MANGELIA MARMOROSA. *Mang. testâ ovatd, solidiusculd, spirid*
breviusculd; longitudinaliter costatd, costis obesis, striis elevatis,
decussatis; sinu amplo; albd, aurantio-fusco perparce maculatd.

Hab. — ?

MANGELIA CASTA. *Mang. testd ovato-turritâ, longitudinaliter cos-*
tatd, costis tenuibus subdistantibus, lævigatd; aperturâ brevi,
basi truncatâ; carneo-fuscd, obscurè fasciatd, costis albicantibus.

Hab. — ?

MANGELIA OBELISCUS. *Mang. testd subulatd, hexagonâ, basi trun-*
catâ, striis pulcherrimis elevatis undique creberrimè cingulatâ,
longitudinaliter costatd, costis distantibus, sequentibus; aperturâ
minutâ, ovatâ; sordidè albd, aperturâ fauce lutescente.

Hab. Islands of Corrigidor, Philippines (found among coarse sand
at the depth of ten fathoms); Cuming.

MANGELIA BALTEATA. *Mang. testd elongatd, subfusiformi, longi-*
tudinaliter costatd costis angustis, distantibus; albd, zonâ fuscd
conspicud cingulatd.

Hab. — ?

MANGELIA ASTRICATA. *Mang. testd subfusiformi-ovatd, spirid bre-*
viusculd, suturis profundis; longitudinaliter costatd, costis cre-
briusculis; albidâ, zonâ fuscd angustâ cingulatd.

Hab. — ?

MANGELIA BADIA. *Mang. testd fusiformi-ovatd, concentricè plicato-*
costatd, transversim fortiter striatd; castaneo-fuscd.

Hab. — ?

MANGELIA PELLUCIDA. *Mang. testd ovatd, utrinque attenuatd,*
lævigatd, pellucidâ, nitidâ, longitudinaliter crebricostatd; albidâ,
basi fuscd.

Hab. — ?

MANGELIA ANGULATA. *Mang. testd fusiformi-ovatd, anfractibus*
medio peculiariter angulatis, suturis profundis, longitudinaliter cos-
tatis, costis angulos super mucronatis; albidâ, fuscescente lineatâ.

Hab. Bay of Manila (found in sandy mud at the depth of four fathoms); Cuming.

MANGELIA PURA. *Mang. testâ oblongo-ovatâ, spirâ subturritâ, suturis profundis; anfractibus concentricè costatis; albidd, maculis perpaucis aurantio-fuscis.*

Hab. — ?

MANGELIA SOLIDA. *Mang. testâ cylindraceo-ovatâ, utrinque attenuatâ, solidâ, undique creberrimè granoso-clathratâ; aperturâ longiusculâ; purpurascente.*

Hab. Island of Burias, Philippines (among sand at the depth of seven fathoms); Cuming.

MANGELIA DEBELICTA. *Mang. testâ ovatâ, longitudinaliter fortiter concentricè costatâ, transversim subobsolete striatâ; fuscescente.*

Hab. — ?

MANGELIA ZEBUENSIS. *Mang. testâ ovato-oblongâ, spirâ acuminatâ, basi subattenuatâ, concentricè fortiter costatâ, transversim creberrimè striatâ; fuscescente.*

Hab. Island of Zebu, Philippines (found in sandy mud at the depth of four fathoms); Cuming.

MANGELIA CINCTA. *Mang. testâ subfusiformi-ovatâ, spirâ turritâ, suturis subprofundis; anfractibus supernè angulatis, longitudinaliter costatis, costis distantibus; albidd, anfractibus fasciâ latâ fuscescente supernè cinctis.*

Hab. Island of Bohol, Philippines (found under stones at low water); Cuming.

MANGELIA DIGITALIS. *Mang. testâ fusiformi-ovatâ, solidâ, undique creberrimè granoso-clathratâ; albicante, zonis duabus purpureis angustis cingulatâ.*

Hab. — ?

MANGELIA NANA. *Mang. testâ ovatâ, spirâ brevi, turritâ, apice acutâ; anfractibus supernè angulatis, longitudinaliter oblique costatis, interstitiis cavis, subtiliter striatis.*

Hab. Island of Mindanao, Philippines (found in sandy mud at the depth of twenty-five fathoms); Cuming.

MISCELLANEOUS.

ON THE DEVELOPMENT OF THE MEDUSÆ.

DR. REID directed the attention of the Society to some observations he had made on the young of the Medusæ. He mentioned, that many of the members of the Society were probably not aware, that the researches of Sars and Siebold had shown that the young of the Medusæ (the common sea-nettles and sea-blubber of our coasts) live for a time like polypes; and that, during their polype life, they generate other animals like themselves, all of which afterwards become Medusæ. This very curious fact has of late naturally attracted a

good deal of attention. The specimens upon which these observations were made, were found by Mrs. Macdonald on the 15th of September last, adhering to the lower surface of a stone lying in a shallow pool near low-water mark. When obtained, they were between thirty and forty in number; and the largest was between two and three lines in length. When examined under the microscope, they presented characters somewhat intermediate between a hydraform and actiniform polype, but still different from either; and it was not until Dr. Reid had completed his examination of their structure, that he discovered that this animal had been described by Sars, first under the name of *Scyphistoma*, and afterwards as the young of one of our common Medusæ (*Medusa aurita*).

After giving a description of the external characters of these animals, and pointing out that this agreed in the main with that by Sars, Dr. Reid then proceeded to explain the results of a more minute examination of their structure.

The body of the animal is composed of two distinct layers—an internal and an external. The internal contains numerous nuclei and nucleated cells, is thicker and more opaque than the external, which, on the other hand, is chiefly composed of a structureless substance, having numerous oval cells (filiferous capsules) on its outer surface, measuring about $\frac{1}{800}$ th part of an inch in their largest diameter, and having coiled up in their interior a long spiral thread, which was occasionally seen uncoiled, and projecting from one end of the cell, along with its lining membrane. Filiferous capsules are also found in smaller number upon the inner surface of the internal layer. The internal layer, which, as has been already stated, is so rich in nuclei and nucleated cells, is folded inwards, and forms the four projections seen on the internal surface of the stomach. Each of these projections is a canal, as may be distinctly made out, on making a transverse section of the body and placing it under the microscope: and the four canals thus formed terminate at their upper end in a circular canal, placed round the mouth, and near the margin of the disc. Into this circular canal the hollow tentacula open. The inner surface of this circular canal and of the tentacula is lined by a prolongation of the internal layer. Between the mouth and margin of the disc are four round depressions, corresponding to the termination of the four vertical in the circular canal, which at first sight appear to be four apertures opening into the circular canal; but a membrane is stretched across the bottom of each depression, sufficiently thin to permit the ready transmission of fluids through it. In certain positions of the extensible mouth, white lines presenting the appearance of vessels are seen passing from the position of the circular canal to the margin of the mouth, and uniting with each other along this margin; but Dr. Reid has not yet been able to satisfy himself that these are vessels. In some of the numerous forms which the mouth assumes, these lines entirely disappear, and when present they seem to be formed by narrow ridges on the external surface. The margin of the mouth presents some indications of the

presence of a canal, but he had not been able to satisfy himself that one actually exists there. The external surface of the tentacula, especially at their edges, is covered by a great number of the filiferous cells or capsules, already described as being present in the external layer of the body. The edges and inner surface of the mouth, and the whole of the surface of the internal cavity or stomach, are covered with cilia; and minute cilia, not easily detected, are present on the outer surface of the tentacula, so that currents of water, unless when the mouth is shut, are constantly passing in and out from the stomach and along the tentacula.

These animals increased considerably in size, and began to produce stolons and buds about the middle of January; and though at this period the original number had been considerably reduced, the whole lower surface of the stone is now almost covered with them, and at present they amount to between 200 and 300. Whenever a stolon or bud is formed, this commences by a thickening of the internal layer at that part, which causes a bulging outwards of the external layer. Some of the buds were detached, and cilia, in motion, were observed upon their external surface, though none have yet been detected upon the external surface of the body where buds were not forming. Some of these buds were found detached, probably by accident, and lying at the bottom of the vessel in which the stone is kept, and these passed through the same amount of development as those adhering to the body of the animal, and in due time attached themselves to the surface of the vessel in which they were kept. In several animals the upper half of the body was cut off transversely by Dr. Reid, and after three or four days the lower or cut end closed in, and by the sixth day they had attached themselves firmly to the inner surface of the vessel, and shortly assumed all the appearances of the entire animal, sending out stolons and forming buds; new tentacula and a new mouth were also, after several days, formed upon the upper end of the lower half of the divided animals. Several were cut longitudinally through their whole length, and when means were not taken to keep the cut edges apart, they again soon adhered, and no traces of the incisions remained. In one the two halves were kept apart, and in each the cut edges approximated and adhered, and two separate animals were thus produced. Several were separated from the stone to which they adhered, and, if not much disturbed, they attached themselves in the course of three or four days to the inner surface of the vessel. Several were found adhering to the inner surface of the vessel in which the stone is kept; and two small specimens were observed upon the outer surface of a small mussel, which had been placed in the vessel containing them a few days before; and when this mussel was removed to a separate vessel, they left the surface of the mussel, and attached themselves to the inner surface of the vessel. The greater number of them, however, appear to remain nearly stationary. These animals did not divide into young Medusæ in March and April, as was to be expected, but are at the present time still propagating themselves by stolons and

buds; and the young thus produced propagate after a certain time in the same manner. While they are adding to their number by propagation, they are also suffering loss by death and other causes. These animals are voracious, and readily seize and swallow univalve or bivalve mollusca, or a crustacean, as large or even larger than their own bodies, and after retaining them in the stomach, generally for more than twenty-four hours, they reject them. They also not unfrequently swallow one of their neighbours, and the retention in the stomach for some time terminates in the destruction and digestion of the inclosed animal. When they seize a molluscan too large to be swallowed, they retain it firmly embraced by the tentacula, and insert their elongated mouth into the interior of the shell; and in like manner they keep dead articulated animals, too large to be swallowed, in their tentacula for more than a day, and in all probability extract nourishment, by acting upon them with their elongated mouth.

The accidental delay in the publishing of the 'Transactions' of the Society for this month enables me to add, that up to this period (27th July) these animals have not yet divided into young *Medusæ*—that they have only just ceased to propagate by buds and stolons—that they appear to be perfectly healthy—and that on the 11th instant a number of fresh specimens were obtained from the sea, adhering to the lower surface of two stones, near the place where the others were found last September.—*From the Transactions of the Literary and Philosophical Society, St. Andrews.*

New species of Mammalia. By J. E. GRAY, F.R.S.

Herpestes semitorquatus. Dark brown, yellow grised; sides and beneath rufous; feet blacker; tail paler; lips thin; throat and lower part of the side of the neck rufous, separated from the colour of the upper part of the neck by a well-defined straight line; fur rather rigid, with a fine brown undercoat; longer hair of the back dark brown, with a broad reddish yellow subterminal band; of the sides bright red-bay; of tail pale yellow, with a broad dark band and yellowish tip. Length: head and body 18·6; tail 11 inches.

Hab. Borneo. Sent to the British Museum by H. Lowe, Esq., in company with *Herpestes brachyurus*.

Felis Charltonii. This species is very like *Felis marmoratus*, but brighter and the dark spots rather differently disposed.

It comes from Darjeeling, in continental India.

It is curious to have two species so nearly allied from such different parts of Asia.

Pteromys punctatus. Bright bay; back ornamented with white spots.

Hab. Malacca.

This is the only species of the genus that has any white on its back. Its skull is much smaller than the other Asiatic *Pteromys*.

The two latter animals were presented to the Museum collection by Andrew Charlton, Esq., of Liskard, Cheshire, with a series of specimens of *Felis marmoratus* from Malacca.

White-thighed Jacchus, *Jacchus leucomerus*. Pale brown; hair pale, with a broad dark terminal band; hinder part of body and legs darker; face and tail black; throat and beneath paler; front edge of thighs and sides of loins white; ears not tufted.

Hab. Bolivia.

Brought to England by Mr. Bridges, and in the collection of the British Museum. This may be *J. melanura*, Geoff.

General Views on the Classification of Animals. By J. D. DANA*.

In Cuvier's classification of animals, the division Radiata includes all invertebrated animals not comprised in either of the subkingdoms Articulata and Mollusca. Consisting thus only of refuse species, and not limited by positive characters, as Owen states, we should not expect that the group could be a *natural* assemblage. No line of subdivision, however, has yet been made out which has met with general favour; yet greater precision has been given to our views of the affinities that run through the animal kingdom, by appealing to the nerves, the seat of sensibility and sentiment, as a basis in classification; and in this manner the subdivisions have been characterized as follows by Dr. Grant:—

I. The *Vertebrata*, having a brain and a spinal cord, constitute the SPINI-VERTEBRATA.

II. The *Mollusca*, having the nerves forming generally a transverse series of ganglia disposed around the cesophagus, the CYCLO-GANGLIATA.

III. The *Articulata*, having no proper brain, and the main cord which runs the length of the body, double, the DIPLO-NEURA.

IV. The *Radiata*, having a radiate structure in the body and the nervous ganglia arranged in a circle, CYCLO-NEURA.

An objection might be made to this system, on the ground of the apparent absence of nerves in some of the lower orders. But a real absence can hardly be concluded from our inability to distinguish them. Many of these animals show by their voluntary motions and sensibility that nervous influences traverse the body: moreover, nervous matter is secreted in lines. We can therefore only infer the indistinctness, and not the absence of nerves, from our ineffectual efforts to trace them out; and we must consequently be guided by general structure, in determining the relations of groups, when the nerves fail of giving aid.

The above arrangement fails, in some respects, of presenting a clear idea of the system in nature, although highly philosophical in its general features. A study of the animal kingdom, as has been lately shown, brings to light lines or general systems of development

* Proceed. Acad. Nat. Sci. Philad. ii. p. 281, Oct. 1845.

branching up from the lowest Infusoria to the higher grades of life. It is not true that the forms among the *lower* grades are actually copied in any of the imperfectly developed young of the *superior*; yet there is some general analogy, sufficient to indicate that the former commence on the same system of development with some of the latter, although carried essentially out of the direct upward line by the peculiar vital forces of the species. The Rotifera are decidedly crustacean in type. Their stout mandibles are precisely those of the Cyclopacea in position, and also in general form; and in their mode of reproduction the animals are closely similar; yet no young crustacean is ever a Rotifer. The latter belongs to the same system of development with the former, but is a distinct branch, from the regular line, characterized by the peculiar natatory organs, which appear to be the analogues of the branchial or basal appendages to the feet in Crustacea. The same reasoning applies to the Bryozoa or Flustroid polyps, which are as nearly allied to the Tunicata as the Rotifers to Crustacea*. It is a side-development from the imaginary line which connects the Infusoria with the tunicated mollusks. The Entozoa afford other examples, one branch of them passing into the Crustacea through the *Lernæidæ* and *Caligidæ*, and another into the Annelida.

These remarks are intended to support no monad or Lamarckian theory, but only to elucidate the established principle, that there are in nature certain distinct systems or types of development. Each species is developed with some reference to one or the other of these systems, but through the agency of the vital forces peculiar to itself—forces which there is reason to believe only creative power can change.

In accordance with these principles, the several orders of animals may be arranged as follows:—

I. VERTEBRATA.		
III. ARTICULATA. Insecta, Myriapoda, Arachnida, Crustacea, Annelida.		II. MOLLUSCA. Cephalopoda, Pteropoda, Gastropoda, Conchifera, Tunicata.
⋮ Rotifera, Entozoa.	IV. RADIATA. Echinodermata. Zoophyta, Acalephæ.	⋮ Bryozoa.
V. PROTOZOA or Infusoria.		

A radiated structure characterizes in general the simplest forms of animal life. Passing up from the monad globule, this structure has its highest development in the Echinoderms. Among Zoophytes,

* The Bryozoa have been placed near the Rotifera; but the absence of mandibles, as well as their peculiar type of structure, separates them widely from these Crustaceoid species, and allies them as closely to the Tunicata, with which they were first associated by Thompson, under the name of Polyzoa. Lister has a finely illustrated article on this subject in the 'Philosophical Transactions' for 1834, p. 365.

the *Hydra* forms the first step upward, in which the digestive cavity is a mere sac, which will work equally well inside-out, and the mode of reproduction is extremely simple. From this group we pass to the *Actinia*, in which there is a distinct stomach and a series of fleshy lamellæ around the internal cavity—the first rudiments of an isolation of the functions of digestion and generation; but the circulating fluid is only the elaborated chyle mingled with more or less water from without. A step further and we find separate organs for the functions of the liver and a circulating system in some Echinoderms. Through the Bryozoa the Infusoria are connected with the Tunicata and the other mollusks; and through the Rotifera and Entozoa they connect with the Articulata, thus passing by each way, out of the true Radiate type, into that which characterizes the higher subkingdoms. The Bryozoa, Rotifera and Entozoa may be arranged in the subkingdom Radiata, or with the Mollusca and Articulata, whose types of structure they exhibit, though under a Radiate form.

The Echinoderms, although so strikingly peculiar in some species, the *Echini*, yet, through the *Holothuria*, bear closely upon the Articulata; while the Acalephs incline toward the Mollusca.

In the above remarks, it is not attempted to trace out all the gradations in the groups referred to, but only the most prominent. The animal kingdom is throughout a network of affiliations, yet there are main trunks and larger branches, to which the smaller anastomosing ramifications are subordinate. Much study will be required before the system of nature from the Protozoa up can be correctly mapped out.

On two new species of Antelopes in the British Museum Collection.

By J. E. GRAY, F.R.S.

Senegal Gazelle. Gazella rufifrons.—Bay-brown (yellowish in summer), with a paler upper and oblique lower black streak; front of face yellow bay; face-streak, back of feet, chest, belly and vent white; tail black; edge of anal disc dark; knees without any tuft, with a ridge of rather longer hairs nearly to the foot. Larger than *G. Dorcas*.

Var. Nose black in front; young paler.

Hab. Senegal. Purchased in Paris.

Easily known from *G. Dorcas* by the want of the knee-tuft. We have two males, two females and a kid. The *Corinne*, F. Cuv. Mam. Lithog. t. , not of Buffon.

Isabella Gazelle. Gazella Isabella.—Fur short, very soft; pale yellowish brown, with a broad, rather paler oblique streak on the upper part of the sides; knee-tufts, front of face and lower face-streak darker yellow-brown; upper face-streak, chest, belly, vent and inside of the limb white; tail black. Young paler, lower part of sides rather darker.

Hab. N. Africa; Egypt, J. Burton, Esq.; Cordofan, M. Sundevall. We have three males, one female and three young.

This species is known from *G. Dorcas* by the softness of the fur, the absence of the dark streak on the side and on the edge of the anal disc; both these species have the under sides of the feet and the back edge of the tarsus white, while in *G. Dorcas* there is a tuft of soft black hair under the feet, and the back of the tarsus is red.

METEOROLOGICAL OBSERVATIONS FOR JULY 1846.

Chiswick.—July 1. Fine: cloudy. 2. Densely clouded. 3. Cloudy: clear and fine. 4. Sultry: hot and dry. 5. Excessively hot: showers: cloudy. 6. Fine: heavy showers. 7. Overcast and fine. 8. Overcast: rain. 9. Overcast: heavy rain. 10. Showery. 11. Overcast: light clouds and fine. 12. Clear and fine. 13. Cloudless and hot. 14. Hot breeze. 15. Overcast: fine. 16. Rain: densely overcast. 17. Cloudy and fine. 18. Constant rain: cloudy and fine. 19. Showers. 20. Very fine. 21. Fine: cloudy. 22. Hot and dry. 23. Cloudy: clear and fine. 24. Overcast: rain. 25, 26. Very fine. 27—29. Cloudy and fine. 30, 31. Very hot.

Mean temperature of the month 65°·46

Mean temperature of July 1845 61·43

Mean temperature of July for the last twenty years ... 62·96

Average amount of rain in July 2·38 inches.

Boston.—July 1. Fine: rain p.m. 2. Fine. 3. Cloudy: 3 o'clock p.m. thermometer 80°. 4. Fine: 4 o'clock p.m. thermometer 84°. 5. Fine: 10 o'clock a.m. thermometer 87°: 12 o'clock a.m. 90°: hail and rain, with thunder and lightning, accompanied with a tremendous wind p.m.* 6. Windy: rain p.m. 7. Windy. 8. Cloudy: rain p.m. 9. Rain: rain p.m. 10. Rain. 11. Cloudy. 12. Fine. 13. Cloudy. 14. Fine: 3 o'clock p.m. thermometer 81°. 15. Fine. 16. Fine: rain p.m. 17. Fine. 18. Cloudy: rain p.m. 19. Cloudy. 20. Fine. 21. Cloudy: rain p.m. 22, 23. Cloudy. 24. Cloudy: rain p.m. 25, 26. Fine. 27. Cloudy: rain early a.m. 28. Cloudy: 2 o'clock p.m. thermometer 81°. 29—31. Fine.—I cannot find so hot a month in all my journal except last month.

Sandwich Manse, Orkney.—July 1. Cloudy. 2. Cloudy: rain: clear. 3. Rain: cloudy. 4. Drizzle: clear. 5. Cloudy: rain. 6. Cloudy: drizzle: showers. 7. Drizzle: showers. 8. Bright: clear. 9. Cloudy: clear. 10. Bright: cloudy. 11. Cloudy: rain. 12. Fog. 13. Fog: rain. 14. Cloudy. 15. Showers: clear. 16. Bright: clear. 17. Cloudy: showers. 18. Bright: drizzle. 19. Showers: clear. 20, 21. Bright: showers. 22. Fog: showers: clear. 23. Cloudy: drops: clear. 24. Cloudy: clear. 25. Bright: drops. 26. Clear: cloudy. 27. Bright: cloudy. 28. Showers: clear. 29. Clear: fine. 30. Bright: fine. 31. Fog: fine.

Applegarth Manse, Dumfries-shire.—July 1. Showers all day. 2. Showers a.m.: fine p.m. 3. Wet morning: cleared. 4. Fair and fine. 5. Fine a.m.: thunder and rain p.m. 6. Tremendous rain. 7. Very fine. 8. Rain p.m. 9. Rain. 10. Fair and fine. 11. Fine: slight drizzle. 12. Wet morning: cleared. 13. Fair, but threatening. 14. Very fine. 15. Showers p.m. 16. Showery. 17. Fine: showers. 18. Slight showers. 19. One slight shower. 20. Fine: slight shower. 21, 22. Showery all day. 23. Wet all day. 24. Showers. 25. Fair and fine. 26. Rain p.m. 27. Drizzly. 28. Dropping day. 29—31. Fine: fair.

Mean temperature of the month 59°·2

Mean temperature of July 1845 56·2

Mean temperature of July for 23 years 58·1

Mean rain in July for 18 years 3·90 inches.

Mean rain in July 5·79 „

The hottest day since 31st July 1826.

Meteorological Observations made by Mr. Thompson at the Garden of the Horticultural Society at CHISWICK, near London; by Mr. Veall, at BOSTON; by the Rev. W. Dunbar, at Applegarth Manor, DUMFRIES-SHIRE; and by the Rev. C. Clouston, at Sandwick Manor, ORKNEY.

Day of Month.	Barometer.				Thermometer.				Wind.			Rain.				
	Chiswick.		Dumfries-shire.		Orkney, Sandwick.		Chiswick.	Dumfries-shire.	Orkney, Sandwick.	Chiswick.	Dumfries-shire.	Orkney, Sandwick.	Chiswick.	Dumfries-shire.	Orkney, Sandwick.	
	Max.	Min.	8 a.m.	4 p.m.	9 a.m.	3 p.m.										8 a.m.
1846. July.																
1.	30.014	29.973	29.43	29.70	29.70	29.60	70	58	65	51	56	55	calm	sw.	calm	sw.
2.	30.074	29.988	29.37	29.75	29.76	29.87	75	59	67	51	60	54	calm	sw.	calm	sw.
3.	30.165	30.129	29.52	29.92	29.80	29.78	80	46	69	63	62	61	calm	sw.	calm	sw.
4.	30.154	30.090	29.50	29.90	29.87	29.91	92	66	72	57	67	63	calm	sw.	calm	sw.
5.	29.768	29.608	29.14	29.70	29.88	29.65	95	50	81	50	60	52	calm	sw.	calm	sw.
6.	29.630	29.448	28.97	29.24	29.36	29.45	71	55	69	53	54	49	calm	sw.	calm	sw.
7.	29.876	29.744	29.16	29.56	29.60	29.73	72	40	62	63	50	50	calm	sw.	calm	sw.
8.	29.850	29.764	29.34	29.69	29.65	29.81	68	56	59	59	45	51	calm	sw.	calm	sw.
9.	29.669	29.641	29.18	29.64	29.65	29.82	72	56	61	63	54	50	calm	sw.	calm	sw.
10.	29.987	29.734	29.20	29.79	29.87	29.90	73	45	64	67	53	55	calm	sw.	calm	sw.
11.	30.140	30.083	29.55	29.96	29.92	29.86	73	49	62	62	50	55	calm	sw.	calm	sw.
12.	30.142	30.070	29.55	29.89	29.90	29.90	78	49	62	64	53	57	calm	sw.	calm	sw.
13.	30.063	29.717	29.47	29.90	29.81	29.75	87	58	69	65	59	55	calm	sw.	calm	sw.
14.	29.771	29.664	29.12	29.68	29.66	29.67	84	74	73	71	55	60	calm	sw.	calm	sw.
15.	29.907	29.812	29.25	29.73	29.70	29.65	84	74	73	71	55	60	calm	sw.	calm	sw.
16.	29.703	29.504	29.10	29.50	29.25	29.46	76	55	68	63	58	55	calm	sw.	calm	sw.
17.	29.511	29.406	28.80	29.13	29.21	29.13	70	55	68	63	58	55	calm	sw.	calm	sw.
18.	29.450	29.294	28.82	29.10	29.02	29.18	71	51	58	60	48	59	calm	sw.	calm	sw.
19.	29.898	29.574	29.80	29.32	29.52	29.54	74	52	63	64	46	55	calm	sw.	calm	sw.
20.	29.995	29.828	29.39	29.68	29.72	29.64	78	51	63	64	46	55	calm	sw.	calm	sw.
21.	29.905	29.833	29.24	29.58	29.51	29.66	73	55	63	64	46	55	calm	sw.	calm	sw.
22.	29.923	29.873	29.25	29.61	29.68	29.55	76	54	63	65	53	57	calm	sw.	calm	sw.
23.	29.753	29.425	29.26	29.55	29.43	29.36	80	58	67	61	56	59	calm	sw.	calm	sw.
24.	29.753	29.425	29.26	29.55	29.43	29.36	80	58	67	61	56	59	calm	sw.	calm	sw.
25.	30.067	29.957	29.35	29.70	29.61	29.46	76	45	66	65	55	61	calm	sw.	calm	sw.
26.	30.152	30.123	29.53	29.93	29.93	29.85	76	45	66	65	55	61	calm	sw.	calm	sw.
27.	30.402	30.157	29.54	29.93	29.93	29.85	76	56	66	67	53	59	calm	sw.	calm	sw.
28.	30.218	30.126	29.58	29.98	29.98	29.93	75	63	65	66	56	58	calm	sw.	calm	sw.
29.	30.092	29.981	29.40	30.01	30.04	30.16	83	53	74	68	59	59	calm	sw.	calm	sw.
30.	29.975	29.937	29.34	30.01	30.08	30.25	89	62	74	74	66	61	calm	sw.	calm	sw.
31.	29.956	29.876	29.39	30.07	30.18	30.09	89	64	70	74	59	63	calm	sw.	calm	sw.
Mean.	29.933	29.809	29.31	29.701	29.699	29.708	76.64	54.29	67.0	65.0	54.1	58.32	1.78	1.98	5.79	2.13

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 119. OCTOBER 1846.

XXIV.—*Revision of the British Libellulidæ.* By Baron EDM. DE SELYS LONGCHAMPS (of Liège), Member of various Academies.

BEING engaged in the preparation of a revision of the Libellulidæ of Europe, intended to serve as a supplement to the monograph which I published in 1840, I have examined with the greatest care the British Libellulæ, taking advantage of the journey which I made in the summer of 1845 in England, Scotland and Ireland. The notice which I now offer is the result of those investigations: it contains principally:—

1. The enumeration of the species which I saw in the various collections.

2. Their synonymy in accordance both with the general revision which I shall soon publish, and with the names which they bear in the principal British works.

3. Their respective geographical distribution in England, Scotland and Ireland, with the citation of the authors or the collectors on whose evidence I have admitted them into the British fauna.

I shall in general pass in silence the times of appearance and the detailed enumeration of the localities where each species was taken: they will be found in the English works cited in the synonymy.

It is not to be wondered at that, the Neuroptera being generally neglected by entomologists, the synonyms given by authors should not always be correct. I have not deemed it indispensable to give a very detailed correction of them: the important object was to record what I have myself *seen*, in these collections, and to determine exactly the species in accordance with my works. Still less do I think it necessary to notice the errors of determination which exist in several collections, unless these determinations have been cited in published works. I beg those gentlemen who granted me admission to their museums with so much kindness, to receive the expression of my gratitude. It is solely to them

Ann. & Mag. N. Hist. Vol. xviii.

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that I am indebted for having been able to throw light upon the synonymy of the British Libellulidæ, by numerous comparisons. I must particularly mention the following gentlemen :—Mr. E. Doubleday, who facilitated my researches in the British Museum, and in the collection of the late Dr. Leach, which is deposited there ;—the Rev. F. W. Hope of London, whose museum is an inexhaustible source of study for all branches of entomology ;—Mr. J. F. Stephens of London ;—Mr. John Curtis of Hayes ; [The collections of these two last gentlemen are classical for British entomology.]—Mr. W. Evans of London ;—Mr. Westwood of London ;—Mr. E. Newman, with whom I visited the typical collection of Linnæus, and that of Sir J. Banks, determined by Fabricius ; both of them deposited in the Linnæan Society of London ;—the Rev. Leonard Jenyns of Swaffham Bulbeck ;—Mr. Babington and Mr. Wollaston of Cambridge ;—Mr. R. Ball, who procured for me admission to the Irish collections at Dublin, and especially that of Miss Ball, his sister ;—Mr. W. Thompson of Belfast, who rendered me the same service in the collections of Messrs. Haliday, Hyndman, &c. ;—Dr. Balfour and Dr. Colquhoun of Glasgow ;—Dr. Greville and Mr. Wilson of Edinburgh ;—Mr. J. Blyth of Glasgow ;—Mr. Wailes and Mr. Hancock of Newcastle.

I had not time to visit the collection of Mr. Dale in Dorsetshire, so rich in British Libellulidæ, but that entomologist has furnished me with very detailed accounts ; and as I have seen in the British Museum typical specimens sent and determined by Mr. Dale, I can supply this omission and cite his observations with precision. I must here bear witness to the perfect acquaintance which Mr. Dale possesses with the family of insects which is now under our consideration.

I hope that I have not committed any error as to the determination of the species in the collections, and have not omitted any species. Doubtless many others will be discovered in making new researches, and some which have only been observed in England exist also in Scotland and Ireland, these two last countries having been little explored for this purpose. This list contains forty-six species ; eight of them *, resting on the capture of only

* I must however remark, that on visiting, from the 15th to the 25th of July, several apparently very favourable localities in Scotland, and that in very fine weather, I was much surprised not to see there, so to speak, any Libellulidæ, except the *Æschna juncea* in small numbers, and some *Libellula scotica*, *Agrion minimum*, *pulchellum*, *cyathigerum* and *elegans*, and moreover not in all these localities, which are—Tarbet (Loch Lomond), Inverary (Loch Fine), Oban, Foyersfall. In the marshes above these celebrated waterfalls, I did not see any Libellulidæ. Is this to be attributed to the composition of the waters, which themselves depend on the geological constitution of the country ? The Ardennes in Belgium, the uncultivated heaths

an isolated specimen, ought to be sought for again before being regarded as positively British,—the more so, as the accounts of the occurrence of several of them do not present satisfactory details: these are—

Libellula vulgata.

Fonscolombii.

Cordulia metallica.

Gomphus flavipes.

Gomphus forcipatus.

Lestes viridis.

virens.

barbana.

[I shall not mention the *Libellula viridula* ~~*Sparshali*~~, Dale MSS., named after the only specimen, which Mr. Sparshall thought he took at Horning, because Mr. Curtis supposes it exotic.] There remain at all events thirty-eight very certain species.

On examining the total list of the forty-six species, I find that forty-four inhabit England, twenty-two Scotland, and twenty-two Ireland. No species is exclusively peculiar to the British Isles; all are found in other parts of Europe.

Mr. W. Thompson of Belfast, in his able Report on the Fauna of Ireland (1843), compares the number of Reptilia which are found in Belgium with those of England, and also with those of Ireland; and he remarks that, in going from east to west, the number successively diminishes, almost in the same proportion between Belgium and England as between England and Ireland. In fact Belgium possesses twenty-two Reptilia, England eleven, and Ireland five. With respect to the Libellulæ, England possesses, it is true, double the number of those of Ireland, but Belgium has only a third more than England; that is to say, fifty-eight species, but in truth *positively* Belgian. All the British Libellulæ are equally found in Belgium, except the *Cordulia Curtisii* and the *Agrion tenellum*, two species of the south-west of France and of Spain, and the *Gomphus flavipes*.

In addition to these, Belgium possesses—

Libellula brunnea, *Fonsc.* (cærulescens, *De Selys*, olim.)

Libellula pedemontana, *Allioni*.

rubicunda, *L.*

pectoralis, *Charp.*

caudalis, *Charp.*

Epitheca bimaculata, *Charp.*

Cordulia flavomaculata, *Van der Lind.*

Gomphus pulchellus, *De Selys* (nec *Steph.*).

Cordulegaster bidentatus, *De Selys*.

Æschna affinis, *Van der Lind.*

Lestes fusca, *Van der Lind.*

Sophia speciosa, *Charp.*

Agrion lunulatum, *Charp.*

hastulatum, *Charp.*

Lindeni, *De Selys*.

As the species of Libellulidæ have in general a habitat which extends over many countries, but are often wholly local, it is probable that several of the fifteen Belgian species above mentioned will be found in Great Britain.

of which have the greatest analogy to those of the Highlands, is also very poor in Libellulidæ, and is remarkable for the presence of the *Cordulia arctica*, which has been also found in Scotland and in Scandinavia.

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Tribe 1. LIBELLULINA.

Division 1. LIBELLULOIDES.

Genus 1. *Libellula*, L.

1. *Libellula quadrimaculata*, L., Steph., Curt.; Evans, pl. 17. f. 1.
 Var. *pranubila*, Newm., Steph.; Evans, pl. 17. f. 2.
 England. General.—Mus. Steph., Curt., Dale, Jenyns, Evans.
 Scotland. Mus. Dr. Greville, Blyth.
 Ireland. Mus. Miss Ball, Hyndman, Haliday.
2. *L. depressa*, L., Steph., Curt.; Evans, pl. 16. f. 1—2.
 England. General. Mus. Steph., Curt., Dale, Jenyns, Evans.
 Scotland. Mus. Dr. Greville.
 Ireland. Mus. Miss Ball.
3. *L. fulva*, Müll.
L. conspurcata, Steph., Curt.; Evans, pl. 16. f. 3; De Selys (olim).
L. bimaculata, Steph., Evans (exclus. synonym.).
L. fugax, Harris.
L. quadrifasciata, Donovan.
 England. Local.—Mus. Steph., Curt., Dale, &c.

N.B. The description given by Mr. Stephens relates in part to the true *L. bimaculata* described by Charpentier, a species foreign to England.

4. *Libellula cancellata*, L., Steph., Curt., Donovan.; Evans, pl. 17. f. 3—pl. 18. f. 1.
England. Local.—Mus. Curt., Steph., Dale, Evans.
5. *L. cærulescens*, Fab., Steph., Curt.; Evans, pl. 18. f. 2, 3.
L. biguttata, Donovan.
L. Donovanii, Leach.
L. Olympia, Fonscol., De Selys (olim).
England. Local.—Mus. Steph., Curt., Dale, Jenyns, &c.
Scotland. Mus. Wilson, Blyth.
Ireland. Mus. Haliday, Hyndman.
6. *L. sanguinea*, Müll.
L. rufostigma, Newm.; Steph. Nomencl. and Ill.; Evans, pl. 19. f. 3—4 (adultus).
L. basalis, Steph.; Evans, pl. 21. f. 1 (junior).
L. Ræselii, Curt., De Selys (olim).
L. angustipennis, Steph. Nomencl. and Ill.; Evans, pl. 20. f. 2; Curt.
England. Local.—Mus. Steph., Curt., Dale, Evans.
7. *L. flaveola*, L., Steph.; Evans, pl. 21. f. 2.
L. flaveolata, Curt.
England. Local.—Mus. Steph., Curt., Dale, &c.
Scotland. Steph.
8. *L. Fonscolombii*, De Selys.
(Not indicated by English authors.)
England. A female specimen in the collection of Mr. Stephens. He thinks he took it near London.
- ? 9. *L. vulgata*, L.
L. veronensis, Curtis. *Br. Ent.*
England. A single female specimen taken at Hull (Mus. Dale). I have not seen it, and as it is difficult to distinguish well the true *vulgata* from the *striolata*, I can at this moment enumerate it only with doubt.
10. *L. striolata*, Sharp.
L. vulgata, Steph., Curt., Donovan.; Evans, pl. 20. f. 3; De Selys (olim) partim (exclusis synonymis).
L. veronensis, Steph. Collect. MSS. (Cited with doubt in my monograph as the *L. Fonscolombii*.)
England. General.—Mus. Steph., Curt., Dale, Evans, &c.
Scotland. Mus. Greville, Blyth, &c.
Ireland. Mus. Miss Ball, Hyndman.
11. *L. meridionalis*, De Selys, 1841.
L. hybrida, Ramb. 1842? (Not indicated by English authors.)
England. A single female specimen from the environs of London (Mus. Evans); another in the collection of Mr. Wailes of Newcastle, but from the south of England (~~sent by J. C. Dale a mistake for vulgata?~~).
J. C. Dale has now the French specimen (a white fly?)

12. *Libellula scotica*, Leach, Donovan, Steph., Curtis; Evans, pl. 19. f. 1, 2 (adult).

L. pallidistigma, Steph. Nomencl. and Ill. 1835; Evans, pl. 19. f. 1 (junior).

England. Local.—Mus. Steph., Curtis, Dale, Jenyns, &c.

Scotland. Very common.—Mus. Greville, &c. Oban, De Selys. Isle of Arran, Steph.

Ireland, Belfast. Mus. Haliday.

13. *L. dubia*, Van der Lind.

L. rubicunda, ~~Leach~~ Coll.; Curtis, pl. 712; Evans, pl. 21. f. 3; De Selys (partim) (exclusis synonymis).

L. leucorhinus, Charp. (adnotatio).

England. Rare and local.—Mus. Curtis, Steph. ~~Dorchester~~, Mus. Dale.

Genus 2. *Cordulia*, Leach.

- ? 14. *Cordulia metallica*, Van der Lind.; Steph. Nomencl. and Ill.; Curtis; Evans (pl. 15. f. 1. more resembles the *ænea* ♀).

L. ænea, Harris? ♀.

England. I have not seen any specimen whose capture in England was certain. It is very doubtful if it is found there.

15. *C. arctica*, Zetterstedt, Faun. Lapp.

C. alpestris, Evans (without description or figure); it is not the *C. alpestris*, De Selys.

C. subalpina, De Selys (Bullet. Acad. Bruxelles).

Scotland. Found by Mr. Weaver, in July 1844, in the Black Forest of Loch Rannoch in Perthshire (Mus. Dale). This species is found in Lapland, Norway, and the Ardennes of Belgium. [I have not seen the specimen taken in Scotland.]

16. *C. ænea*, Linn. (pars). Donovan, Steph., Curtis; Evans, pl. 14. f. 3.

England. Local.—Mus. Steph., Curtis, Evans, Dale, &c.

Ireland? Towards the northern lakes (Haliday). I have not seen the specimens. There is no doubt that a *Cordulia* is found there, but the species has not been determined with certainty.

17. *C. Curtisi*, Dale; Curtis, pl. 616; Steph. Ill.; Evans, pl. 15. f. 2, 3.

C. compressa, Steph. Catal.

England. Local in the south. New Forest, Dorset.—Mus. Dale, Steph., Curtis, &c. ~~Devon D^r Cocks~~.

Division 2. *ÆSCHNOIDÆ*.

Genus 3. *Gomphus*, Leach.

18. *Gomphus vulgatissimus*, L., Steph. Catal., Curtis; Evans, pl. 14. f. 1.

G. forcipatus, Donovan, Steph. Ill., De Selys (olim).

England. Local.—Mus. Steph., Curtis, Dale, Jenyns, Evans.

Ireland. Mus. Miss Ball.

19. *Gomphus flavipes*, Charp.; Steph. Ill. pl. 30. f. 1; Curt.; Evans, pl. 14. f. 2 (♂). ~~as Zoologist p. 1616~~ *Donov. n. sp.*
G. pulchellus, Steph. Catal. (nec Selys).

England. A single male taken at Hastings on the 5th of August 1818 (Mus. Stephens). N.B. I erroneously considered the *pulchellus* of Mr. Stephens as identical with another species of Europe which I have described under the same name. This last alone must retain the name of *G. pulchellus*, Selys.

20. *G. forcipatus*, L.

(Not described by English authors.)

G. unguiculatus, Van der Lind., De Selys (olim).

Æschna hamata, Charp.

England. A single female in the collection of Mr. Stephens, who remembers to have taken it in England. [N.B. The extremity of the abdomen is figured by Mr. Evans by the side of the *flavipes* as the female.]

Genus 4. *Cordulegaster*, Leach.

21. *Cordulegaster annulatus*, Latr., Steph., Curt.; Evans, pl. 13. f. 2.

Æ. Boltoni, Donov.

England. Local: rare. New Forest, York, &c.—Mus. Steph., Dale, &c.

Scotland. Local. Loch Lomond, Loch Katrine.—Mus. Dr. Greville, Blyth, &c.

Ireland. Northern Lakes, Haliday.

Genus 5. *Æschna*, Fab.

22. *Æschna pratensis*, Müll.

Æ. vernalis, Van der Lind., Steph.; Evans, pl. 13. f. 1; De Selys (olim).

Æ. teretiuscula, Leach, Curt.

L. aspis, Harris? *q. var.*

England. Generally.—Mus. Steph., Curt., Dale, &c.

Scotland. Mus. Dr. Greville.

Ireland. Mus. Miss Ball.

23. *Æ. mixta*, Latr.

Æ. affinis, Steph.; Evans, pl. 12. f. 2 (exclus. syn.).

N.B. The description given by Mr. Stephens in 1835 relates in part to the true *affinis*, Van der Lind. ~~as for his description~~

Æ. anglicana, Leach MSS.

L. coluberculus? Harris.

England. Local.—Mus. Steph., Curt., Dale, Evans.

Scotland. In the south.

N.B. Perhaps the *Æ. affinis*, Van der Lind., occurs in England: all that I can say is that I have not seen it, and that the types of the species in Mr. Stephens's collection belong to the *mixta*.

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24. *Aeschna juncea*, L., Steph., Curt.; Evans, pl. 11. f. 2 ♂.
A. mixta, Steph.; Evans, pl. 12. f. 1 ♀? (exclusis synonymis).
A. picta, Charp. *to be read*
 England. Local, particularly in the north.—Mus. Steph., Dale, Jenyns, &c.
 Scotland. General.—Mus. Greville, Wilson, Blyth. Inverness, Thompson. Oban, Inverary. Foyer's Fall, De Selys.
 Ireland. General.—Mus. Miss Ball, Haliday, Hyndman.
25. *A. cyanea*, Müll.
A. maculatissima, Latr., Steph.; Evans, pl. 11. f. 1; De Selys (olim).
A. varia, Shaw, Curt.
A. viatica, Leach. 166
A. grandis, Donovan. ~~P1292 (not P1292) (A. grandis)~~
 England. General.—Mus. Steph., Curt., Dale, Jenyns, Evans, &c.
 Scotland. Mus. Wilson.
26. *A. grandis*, L., Steph., Curt.; Evans, pl. 10. f. 2.
 England. General.—Mus. Curt., Steph., Dale, Evans, &c.
 Scotland. Mus. Greville.
 Ireland. Mus. Miss Ball, Hyndman, Haliday.
27. *A. rufescens*, Van der Lind.; Steph. Ill.; Evans, pl. 10. f. 1.
A. Dalei, Steph. Catal., Curt. *Dalei*
 England. Local, and only in the south. Yarmouth, Mr. Newman.—Mus. Dale, Steph., &c.

Genus 6. *Anax*, Leach.

28. *Anax formosus*, Van der Lind.; Steph. Ill.; Evans, pl. 9. f. 2.
A. imperator, Leach, Steph. Catal., Curt.
 England. Local in the south. New Forest, Cambridge.—Mus. Steph., Curt., Dale, Jenyns, &c.

Tribe 2. AGRIONINA.

Division 1. CALOPTERYGOIDES.

Genus 7. *Calopteryx*, Leach.

29. *Calopteryx virgo*, L. (pars); Steph. Ill. (partim), var. β , γ , e; Curtis.
C. Ludoviciana, Steph.; Evans (partim), pl. 7. f. 3 ♂, semi-adult—that given as the female pl. 8. f. 1. belongs to the *splendens* of intermediate age (exclusis synonym.).
C. Xanthostoma, Steph. Ill. (male, semi-adult).
C. anceps, Steph.; Evans, pl. 9. f. 1 (junior = *Cal. vesta*, Charp.).
C. hamorrhoidalis, Evans, pl. 8. f. 2, 3 (adult).
 England. Local.—Mus. Steph., Curt., Dale, Evans, &c.
 Scotland. Mus. Wilson, Blyth.
 Ireland. Mus. Miss Ball, Hyndman, Haliday. Belfast, De Selys.

30. *Calopteryx splendens*, Harris.
C. Ludoviciana, Leach, Curt., De Selys (olim).
C. virgo (partim), Steph. Ill., var. α , δ ; Evans, pl. 7. f. 1, 2.
 England. General.—Mus. Steph., Curt., Dale, Jenyns, Evans, &c.
 Scotland. Mus. Wilson.
 Ireland. Mus. Miss Ball, Haliday, Hyndman. *Fisher*.

Division 2. AGRIONOIDEÆ.

Genus 8. *Lestes*, Leach.

- ? 31. *Lestes viridis*, Van der Lind.; Evans, pl. 6. f. 3? (exclus. syn.).
 England? A single specimen in the collection of Mr. Evans.
 32. *L. nymphæ*, Kirby?, De Selys!, Evans?, Curtis.
L. sponsa, Steph. (partim: junior), Leach Coll. ♂ ad.
 England. Local.—Mus. Evans, Curt., Leach, Steph.
 Ireland? Mus. Dublin. (*olim Mus. Curtis?*)
 33. *L. sponsa*, Haussemann, Steph. Collect. (partim).
L. autumnalis, Leach (junior), Steph. Catal. and Collect. (♂ adult),
 Curtis.
L. nymphæ, Leach Coll. (junior); Steph. Ill.; Evans Collect.
 (adult).
L. viridis? Curtis (junior).
 England. Local, but in several counties.—Mus. Steph., Curt.,
 Dale, Leach, &c.
 Scotland. Mus. Greville, Blyth.
 Ireland. Mus. Haliday.

- ? 34. *L. virens*, Charp.
L. viridis (partim), Steph. 1835 } exclusis synonymis.
L. sponsa (partim), Steph. Catal. }
 England. New Forest. [A single specimen in the collection of
 Mr. Stephens, another in the Mus. Leach.]

- ? 35. *L. barbara*, Fab.
 (Not described by English authors.)
 Ireland? A male in the Dublin Museum under the name of
nymphæ with a female of the *sponsa*. (*olim in Haussemanni?*)

Genus 9. *Platycnemis*, Charp.

36. *Platycnemis platypoda*, Van der Lind., Steph. 1835, Curt.;
 Evans, pl. 6. f. 1, 2 (partim).
Agrion corea, Leach (partim).
 England. Local.—Mus. Steph., Curt., Dale, &c.
 37. *P. pennipes*, Pallas.
Agrion corea (partim), Leach Coll., Steph. Catal.
A. albicans, Leach MSS.
A. platypoda, var. *albicans*, Steph. Ill.
Libellula albidella, Devillers.
Platycnemis platypoda var., De Selys.

43. *Agrion pulchellum*, Van der Lind.
A. puella, Steph. ; Evans, pl. 3. f. 7, 8 (not good).
A. lunulatum, Evans, pl. 4. f. 3, 4 (exclus. syn.).
A. hastulatum, Evans, pl. 4. f. 5, 6, not good (exclus. synonym.).
A. cyathigerum, Evans, pl. 4. f. 7, 8 (exclus. synonym.).
A. rufescens, Evans (partim), pl. 5. f. 2, not good (excl. syn.).
A. interruptum, Charp.
 England. (~~General~~)—Mus. Steph., Evans, Dale, &c.
 Scotland. Mus. Blyth.
 Ireland. Mus. Hyndman, Haliday. Belfast, De Selys.
44. *A. puella*, L. (pars), Van der Lind.
A. furcatum, Charp, Curt. ; Steph. Ill. ; Evans, pl. 4. f. 1, 2.
A. annulare, Steph. Ill. (female) ; Evans, pl. 5. f. 1 (not good) (exclus. syn.).
A. rufescens, Leach (partim : young male), Curtis.
 England. (~~Local~~) London.—Mus. Steph., Evans, Curtis, Dale.
 Scotland. Mus. Greville, Blyth.
 Ireland. Mus. Miss Ball, Hyndman, Haliday.
45. *A. mercuriale*, Charp.
 (Not described by English authors.)
 England. In the south.—Mus. Dale, Curtis. **Mus. Brit. ♂**
46. *A. cyathigerum*, Charp.
A. annulare, Leach, Steph. Catal. (without any description).
A. hastulatum, Steph. Nomencl. and Ill. (exclus. syn.).
A. brunnea, Evans, pl. 4. f. 8 (junior).
A. zonatum (partim), Steph. Ill.
A. Charpentieri, De Selys, 1840.
 England. Local.—Mus. Steph., Dale, Curt., Evans, &c.
 Scotland, Mus. Greville. Oban, De Selys.
 Ireland. Mus. Miss Ball, Haliday. Belfast, De Selys.
 To this species should probably be referred as a variety, the *Agrion scoticum*, Dale MSS., collected in Scotland.

XXV.—On the Arrangement of the Hollow-horned Ruminants (Bovidæ). By J. E. GRAY, F.R.S.

THE systematic arrangement of these animals has been one of the most difficult subjects for the student of mammalia.

Linnæus (Syst. Nat. i. 27), in his last edition of the 'Systema Naturæ,' divides them into three genera according to the direction of the horn, which he describes as erect in *Capra*, reclinate in *Ovis*, and porrect in *Bos*, and separates these from *Cervus* because they have tubular, while that genus has solid branched and deciduous horns.

Gmelin in his edition adds to these the genus *Antilope* which had been established by Pallas, and characterizes that

genus as having solid horns like the *Cervi*, but simple and persistent. Now I need scarcely observe that these characters will not define the genera, for all *Goats* have not erect horns, if any have, and it is the same with the other genera; and we all know that the Antelopes have tubular horns, in the sense that word is used by Linnæus, as much as the Oxen, Sheep and Goats; but this error of Gmelin has had its influence up to this time, for the horns of Antelopes in Cuvier's first and last edition of '*Le Règne Animal*' are described as having "the nucleus of the horn solid, and without pores or sinuses, like the horns of the Stags."

M. Geoffroy, perceiving that the characters furnished by Linnæus were not sufficient to separate the Antelopes from the other genera, examined the structure of the prominences of the frontal bones which form the core or support of the horns of the Antelopes, and he describes the core of the horns of the Antelopes to be solid and without sinuses, while he characterizes the cores of the horns of the Goats, Sheep and Oxen as in great part occupied with cells which communicate with the frontal sinus, and Cuvier, Latreille and most authors have without re-examination adopted these characters.

Some years ago I examined the cores of the horns of many species of Antelopes for Colonel H. Smith, and found they were all more or less cellular within, and these cells had a communication with the frontal sinus; certainly the cells are not so numerous as in the thick horns of some Oxen, but they are quite as numerous for the thickness of the core; but it is to be remembered that the general character of the horns of Antelopes is to be slender and elongated, and consequently there is not so much room for cells, as their presence would destroy the strength of the core so as not to form a fit support for the horns; and thus this character is merely reduced to one dependent on the small size or slenderness of the horns, which, though usual, is not universal in the genus, for example in the *A. Oreas* and others.

Colonel Smith, aware of this difficulty, divided these animals into two families: *Capridæ*, characterized by having the horns "vaginating upon an osseous nucleus totally or nearly solid," containing the genera *Antilope*, *Capra*, *Ovis*, and a new genus which he called *Damalis* for the Antelopes with high withers; and second, the family *Bovidæ*, with horns "vaginating upon a bony nucleus not solid, but more or less porous and cellular," including the genera *Catoblepas* or *Gnu*, *Ovibos* or *Musk Ox*, and *Bos**.

This arrangement shows that much reliance is certainly not to

* I may remark that Cuvier says that the genus *Bos* has a large naked muffle, yet two species which he refers to it have a hairy muzzle like the Sheep, viz. *Bos grunniens* and *B. moschatus*.

be placed on M. Geoffroy's character for the genus *Antilope*, for here the Goat and Sheep are said to have the same peculiarity as he gives to separate the Antelopes from them.

Several authors after this period considered the subgenera proposed by De Blainville and Colonel H. Smith as genera, and grouped them into families.

Mr. Ogilby, in a theoretical arrangement of Ruminants, published in the 'Proceedings of the Zoological Society' for 1836, divides these animals into two families characterized thus: *Capridæ*, "muffle none;" *Bovidæ*, "muffle distinct, naked." Of this arrangement I need only remark, that he places *Ovibos* in *Capridæ* and *Bos* in *Bovidæ*, *Kemas* or the Jemla Goat in *Bovidæ*, and *Capra* in *Capridæ*, thus separating into distinct families most nearly allied species; while the genus *Ixalus*, which is an antelope with rudimentary horns, is referred to the family *Moschidæ*, and the *Gnu* is entirely overlooked. I am satisfied, if Mr. Ogilby had attempted to arrange a collection by this system, he must have soon abandoned it.

Within the last few years Professor Sundevall of Stockholm has proposed to arrange these animals according to the form of their hoofs, and he has regarded the subgenera of preceding authors as genera, and divided them into four families thus: 1. *Caprina*, containing *Ovis*, *Capra*, *Nemorhedus* and *Oreotragus*. 2. *Antilopina*: *Antilope*, *Dicranoceras* and *Bubalus*. 3. *Bovina*: *Oryx*, *Catoblepas*, *Ovibos*, *Bos*, *Anoa*, *Portax*, *Damalis*. 4. *Sylvicaprina*: *Hippotragus*, *Strepsiceros*, *Cervicapra*, *Calotragus*, *Nanotragus*, *Neotragus*, *Sylvicapra*, *Tragelaphus* and *Tetracerus*. In this arrangement he appears to have overlooked the fact, that the hoofs of these animals are modified according to the kind of country which the animal is destined to inhabit, and therefore this arrangement is dependent on that single circumstance, and not on the considerations of all the peculiarities of the species; hence the species which inhabit rocky pinnacles, as the Thar and Ghoral (*Nemorhedus*) and Klipspringer (*Oreotragus*), are separated from the other Antelopes and placed with the Goats, and the large and heavy Antelopes which inhabit the plains, as the *Oryx*, *Portax* and *Damalis*, are placed with the Oxen.

If this system is fully carried out, the *Rein Deer* should be separated from its allies and placed with the *Musk Ox*; and I am not certain that the *Addax* antelope should not be arranged in the same group, for it has the same shaped hoofs, the sands of the Desert probably requiring the same structure for progression as the snow.

After examining all these arrangements, and after repeated examinations of the animals, I believe that the form of the horns affords the most natural character for subdividing them into

groups; and I think that if the Antelopes are divided into two groups, which appear to me natural, then there is no difficulty in finding neat characters for the definitions of the families.

I. The horns round or compressed, without any raised keel on the inner front angle.

1. The horns smoothish, spread out on the sides, cylindrical or depressed at the base, the knee (or wrist) below the middle of the fore-leg—*Bovæ*.

2. The horns conical, bent back, cylindrical or compressed, and ringed at the base, the knee (or wrist) in the middle of the fore-leg—*Antilopæ*.

II. The horns subangular with a more or less distinct ridge on the front angle, the knee in the middle of the fore-leg.

3. The horns subspiral, erect; tear-bag distinct; forehead flat; male not bearded—*Strepsicereæ*.

4. The horns recurved, compressed; tear-bag none; forehead concave; male bearded—*Capræ*.

5. The horns spiral, bent out on the sides; tear-bag none; forehead convex; male not bearded—*Ovæ*.

The position of the knee is the external mark of the shortness of the cannon bone, compared with the length of the *ulna* or fore-arm bone.

The *Bovæ* consist of the genera *Bos*, *Bibos*, *Bison*, *Rubalus* and *Anoa*, with a naked moist muffle, and *Poephagus* and *Oribos* with a hairy ovine muzzle.

These genera are well distinguished by the form of the intermaxillaries. In *Poephagus* (*grunniens*), *Bibos* (*frontatus* and *Gour*), and in *Bison* (*Urus*), they are short, triangular, acute behind, and not reaching to the nasal, being gradually shorter in proportion from *Poephagus* to *Bison*. In *Bos* (*Taurus*) and *Bubalus* (*Buffelus* and *Caffer*) they are elongate, reaching to the suture between the nasal and cheek-bone, and extending furthest up in *B. Buffelus*.

The *Strepsicereæ* are peculiar for being the only hollow-horned ruminants which are marked with white streaks or spots; they consist of the genera *Portax* from India, *Strepsiceros*, *Boselaphus* and *Tragelaphus* from Africa; the three former have ovine and the last a naked moist nose.

The *Capræ* consist of three genera, *Hemitragus* with a moist muffle, *Ibex* and *Capra* with an ovine hairy one; and *Ovæ* consists only of the genus *Ovis*. It may be remarked that the keel of the horns of these animals, and especially of the Goats, is on the inner part of the front edge of the horns; but in the Marbur or Snake-eater of Affghanistan the strongest keel which forms

the spiral ridge arises from the hinder part of the inner side of the horns, the front one being obscure.

The genera of the *Antilopeæ* being more numerous are worthy of a more minute examination, considering as I do that it is important to divide these numerous genera into natural groups, more especially as there appears to be a character afforded by the nostrils which has been hitherto overlooked, and which separates them into two very distinct and easily recognised sections. This character shows the real position of the *Gnu*, and at the same time proves that Colonel Hamilton Smith was correct in forming his genus *Damalis*, though he did not discover the character by which it was best to be defined, and hence placed with it some species that were not truly allied to it; and it leaves the other *Antelopes* easily reducible into small groups.

The *Antilopeæ* may be thus divided:—

I. The *Antelopes of the Fields* have the nostrils bald within.

1. The *True Antelopes* are light-bodied and slender-limbed, with small hoofs and a short or moderate tail covered with elongated hairs to the base, and lyrate or conical horns.

A. *Horns moderate, lyrate; muzzle ovine.*

SAIGA. Nose very high, compressed, truncated. Horns white, lyrate. *S. Colus*.

KEMAS. Nose of male with a dilatation on each side. Horns elongated, compressed, sublyrate. *K. Hodgsonii*.

GAZELLA. Nose tapering, simple. Horns lyrate. Tear-bag distinct. *G. gutturosa*, *G. subgutturosa*, *G. Dorcas*, *G. rufifrons*, *G. Isabella*, *G. Bennettii*, *G. Sæmmeringii*, *G. Dama*, *G. ruficollis* and *G. mohr*.

ANTILOPE. Nose tapering. Horns lyrate, elongate. Tear-bag none. *A. melampus*.

CERVICAPRA. Nose tapering, simple. Horns cylindrical, subspiral. *C. bezoartica*.

B. *Horns slender, conical, small.*

NEOTRAGUS. Muffle ovine. Crown crested. Tear-bag large, round. *N. Saltiana*.

CEPHALOPHUS. Muffle bald. Crown crested. Tear-bag a linear glandular line. *C. mergens*, &c. See p. 163, &c. of this volume.

NANOTRAGUS. Muffle bald. Tear-bag none. False hoofs none. *N. pygmaea*.

TETRACERUS. Muffle bald. Horns two pairs. Tear-bag longitudinal. *T. quadricornis*.

OREOTRAGUS. Muffle bald. Horns elongate, acute. Tear-

bag transverse. Hoofs square, compressed. Hair thick, wavy. *O. saltatrix*.

CALOTRAGUS. Muffle bald. Horns elongate, acute. Tear-bag transverse. Hoofs triangular. Inguinal pores and knee-tufts none. *C. Tragulus* and *C. melanotis*.

SCOPOPHORUS. Muffle bald. Horns elongate, acute. Tear-bag transverse. Hoofs triangular. Knees with large tufts. Inguinal pores distinct. *S. Ourebi* and *S. montanus*.

ELEOTRAGUS. Muffle bald. Horns elongate, recurved. Tear-bag none. Hoofs triangular. Inguinal pores distinct. *E. Capreolus*, *E. arundinaceus* and *E. reduncus*.

2. The *Caprine Antelopes* are heavy-bodied and limbed and large-hoofed, with a very short depressed tail covered with hair to the base, and with conical horns, rarely with a flat process in front.

CAPECORNIS. Muffle bald. Horns recurved, ringed at the base. Tear-bag large, round. *C. sumatrensis*, *C. bubalina* and *C. crista*.

NEMORHEDUS. Muffle ovine. Horns recurved, ringed at the base. Tear-bag none. *N. Goral*.

MAZAMA. Muffle ovine. Horns nearly erect, ringed at the base, recurved at the tip. Fur of two sorts. *M. americana*.

RUPICAPRA. Muffle ovine. Horns slender, erect, sharply recurved at the tip. Fur soft. *R. Tragus*.

ANTILOCAPRA. Muffle ovine. Horns slender, erect, with a flat process in front and recurved at the tip. *A. americana*.

3. The *Cervine Antelopes* are large-sized, rather heavy-bodied animals, with an elongated tail with short hairs at the base and tufted at the tip. Horns elongate.

KOBUS. Muffle naked. Neck maned. Horns sublyrate, bent forwards at the tip. *K. ellipsiprymnus*, *K. Singsing* and *K. de-fassa*.

AIGOCERUS. Nose cervine. Nape with a reverse mane. Horns elongate, recurved, compressed. Tear-bag covered with hair. *A. leucophaeus* and *A. niger*.

ORYX. Nose cervine. Nape with a reverse mane. Horns elongate, cylindrical, straight or slightly arched. Tear-bag none. *O. Gazella*, *O. Biessa* and *O. leucoryx*.

ADDAX. Nose ovine. Neck not maned. Horns elongate, cylindrical, subspiral. Hoofs broad in front. *A. nasomaculatus*.

II. The *Antelopes of the Desert* have a broad nose, and the nostrils are subvalvular and lined with bristles within.

4. The *Equine Antelopes* have the muffle depressed, spongy and bristly, and the nostrils valvular.

CATOBLEPAS. *C. Gnu* (var. *C. taurina*) and *C. Gorgon*.

5. The *Bovine Antelopes* have the muffle moderate, with a small naked moist muzzle under the nostrils.

BOSELAPHUS. Horns lyrate, thick at the base on the produced upper edge of the frontal bone. Tear-bag covered with a tuft of hair. *B. Bubalis* and *B. Caama*.

DAMALIS. Horns lyrate, tapering. Tear-bag naked. * *D. lunatus*, ** *D. senegalensis*, *D. Koba*, *D. pygarga*, *D. albifrons*, and *D. ? Zebra*.

All these species, except *Gazella Dama* and *G. mohr*, *Scophophorus montanus*, *Capricornis sumatrensis* and *C. crista*, *Mazama americana*, *Oryx Biessa* and *Damalis albifrons*, are in the British Museum collection.

XXVI.—*An Account of some Shells and other Invertebrate Forms found on the coast of Northumberland and of Durham.* By WILLIAM KING, Curator of the Newcastle Museum*.

MOST of the objects treated of in this paper have been obtained at different times from the cobles and the decked boats which frequent the fishing-grounds between the Dogger-bank and the coast stretching from the Tweed to the Tees; the remainder were got during a dredging excursion in a decked fishing-boat on some of the same grounds in the latter part of last June.

Though I was at sea from Monday till Friday, yet in consequence of the extremely unfavourable state of the weather for the greater part of the time, the dredge was not put down more than five times; it will therefore be readily presumed that my dredging operations were not so successful as could be wished.

At every haul of the dredge I was particular in noting the different kinds of objects brought up, the depth of water, and the nature of the sea-bottom.

The dredge was first put down (on Tuesday morning) in fifty fathoms water, not far from the edge of the Dogger-bank, and at about sixty miles east of Sunderland: here it brought up a large number of dead shells in a chalky state, and a few living objects: the former consisted of *Pecten opercularis* and *Macra elliptica* in abundance, several specimens of *Mya truncata* †, two

* Read at the Sixteenth Meeting of the British Association for the Advancement of Science.

† The specimens of *Mya truncata* closely resemble the elongated form found close in shore: finding it at so great a depth demands something more than a passing notice, since I am not aware that this variety has ever been found alive elsewhere than in shallow water. Were it certain that the elongated form did not live in deep water, we might then safely conclude that the sea-bottom which was dredged had subsided since the *Myas*, found on it, were living. Since writing the above I find it stated by Professor E.

or three of the common *Cyprina* (all of which were odd valves), and a single *Scalaria Trevelyaniana*: the living objects were one each of *Trochus tumidus*, *Natica grænlandica*, *Rimula Noachina* and *Mysia undata*, a few specimens of *Chiton cinereus*, two or three of *Pecten opercularis*, half a dozen of *Dentalium entalis*, a *Psolus squamatus* (adhering to the inside of a valve of *Cyprina islandica*), a few young specimens of *Psolus phantapus*, one of *Halichondria mammillaris* (growing on a stone), and a new species of Crustacea of the genus *Æga*. Although very rare, I had previously got from the boats *Natica grænlandica*, *Halichondria mammillaris* and *Psolus squamatus*; the last, as far as I have been able to ascertain, has not been procured on the east coast of Britain before.

In consequence of the sea being very rough, it was decided not to put the dredge down again until the weather turned more favourable, but in this we were disappointed, as a heavy gale came on which compelled us to run in for the Scotch coast, which together with the Cheviots we saw the next morning,—the sea all the time heaving dreadfully. In the evening (Wednesday), the gale having suddenly abated, we thrice succeeded in putting down the dredge in thirty fathoms, and at about as many miles from the south part of the coast of Northumberland. The principal objects brought up were Echinoderms, as *Ophiura texturata*, *Luidia fragilissima*, *Spatangus purpureus*, *Amphidotus cordatus*, along with which were several fine specimens of *Nymphon giganteum*, a few corals and corallines, as *Farcimia salicornia*, *Cellepora Skenei*, *C. ramulosa*, *Eudendrium rameum*, *Tubularia gracilis*, *Thusaria thuia*, &c., a single living specimen of *Pecten striatus*, Müller, two or three of *P. opercularis*, and several fragments of *Sabella lumbricalis* (?). As *Nymphon giganteum* is a rare species*, and the *Pecten striatus* a remarkably fine specimen, and specifically new to our coasts, it may readily be imagined that I was quite content with our evening's operations. The Echinoderms were beau-

Forbes that *Mya truncata* "inhabits the littoral, laminarian and coralline zones on the coast of Great Britain," that is, ranging from between tide-marks to fifty fathoms (vide Memoirs of the Geological Survey, vol. i. pp. 375 and 408). Were all the specimens obtained from these zones in a living state? and were they all of the elongated form? From what I have seen of the variation of *Mya truncata* on our coasts (vide remarks on the variety *M. pelagios*), I am led to suspect that the living specimens from the coralline zone are much shorter than those from shallow water. It is stated by Mr. Lyell that he has intermediate varieties between the normal form of *Mya truncata* and *M. Uddevallensis* (vide Geological Transactions, 2nd ser. vol. vi. p. 137); it would be arriving at an important point in the history of these species if the depth of habitat of the several varieties here alluded to were known.

* First described by Mr. H. D. Goodsir in the Reports of the Berwickshire Naturalists' Club, vol. ii. p. 114. [See also this Journal vol. xv. p. 293.]

tiful specimens; but I much regret to state that the *Luidias* were equally as great adepts in the art of dismembering themselves as those whose suicidal powers are so graphically described by Professor Forbes in his 'History of British Starfishes*.' From the number of fragments that came up of *Sabella lumbricalis* (?), the sea-bottom at this place must have been covered with it. The anchor brought up a quantity of clay resembling a red argillaceous deposit at Seaton, near the mouth of the Tees, and belonging to the new red sandstone series: it would be important to know if the former were really of the same geological age as the latter.

The next day (Thursday) we only succeeded once in throwing out the dredge, which came up filled with nothing but sand. After this unsuccessful haul, which no doubt reminded our boat's crew of their very unsuccessful fishing, we steered in for the land, which we reached on Friday morning.

A few more facts connected with the subject-matter of this paper remain to be noticed. During the early part of the present year, I procured from the boats specimens of four kinds of shells which there is every reason to believe are not living on our coasts at the present day; these are *Astarte elliptica*, *A. compressa* var. *laticor*, *Saxicava sulcata* and *Mya uddevallensis*.

The specimens of *Astarte elliptica*, Brown, generally resemble those so abundant in Loch Gair, but some of them are larger than any I have seen from that locality—the largest specimen being $1\frac{1}{2}$ ths by 1 inch. A few of them resemble the specimen figured by Capt. Brown under fig. 3. pl. 38. of his 'Conchology of Great Britain,' 2nd ed. I am not aware that it has ever been found alive in the German Ocean south of Aberdeenshire, where it has been got by Professor Macgillivray; it occurs in a fossil state at Bridlington, in the basin of the Clyde, at Uddevalla, and on the banks of the Dwina 240 versts above Archangel: from the last-named locality, M. Verneuil has favoured me with specimens closely resembling the variety above-quoted.

My specimens of *Astarte compressa*, variety *laticor*, closely resemble the same variety found fossil at Bridlington. It differs in no respect from the form at present living on our coasts except in being much larger—the former being nearly an inch in diameter (at Bridlington), while my largest specimen of the latter does not exceed half an inch. There is still considerable obscurity hanging over the variety *laticor*: I am led to believe that it occurs at Uddevalla; and probably the so-called *Astarte multicostata* of Smith found in the Clyde beds is the same shell. I am not aware that it has been found anywhere in a living state.

* Pp. 138 and 139.

I have only got one specimen of the so-called *Savicava sulcata* of Smith, which is generally considered a large form of *Savicava rugosa*. My specimen is the size of that figured by Mr. Lyell in the 'Philosophical Transactions' for 1835, pl. 2. fig. 24. Mr. Lyell states that Capt. Bayfield has found it alive in the Gulf of St. Lawrence, and I believe it occurs in all the fossiliferous localities already mentioned.

My specimens of *Mya uddevallensis** are identical in every particular with those figured by Mr. Lyell in his paper "On the Fossil and Recent Shells collected by Capt. Bayfield in Canada†." It differs from *Mya truncata* in being shorter, "and the posterior truncation oblique and inclined to the basal margin, and with a smaller sinus in the muscular (pallial) impression‡." It occurs in a fossil state at Uddevalla, in Canada, in Northern Russia, and in the basin of the Clyde; and it is still living in the Gulf of St. Lawrence§.

All my specimens of the foregoing shells have very much the appearance of the Norwich crag and Uddevalla fossils—a circumstance which, viewed in connexion with what has just been stated, and the fact that none have yet been found living in the locality where they occur, is strongly in favour of the conclusion that they are pleistocene fossils. As far as I can learn, they were brought up from a shell-bank situated about twenty-five miles to the east of the Fern Islands. If my inference respecting the age of these fossils be correct, it is necessarily proved, that the place where they occur was covered with the sea during the pleistocene period.

HALICHONDRIA MAMMILLARIS = *Spongia mammillaris*, Müller.

This sponge does not appear to be common on our coasts. Of two specimens which I have procured, one was brought up by the lines from deep water||, and the other I dredged in fifty fathoms. The base of either does not exceed an inch in diameter; the mammillations are three-quarters of an inch in length.

HALICHONDRIA, nov. spec. ?

As the sponge under consideration has some characters in common with *Halichondria ficus*, which is "liable to some modifica-

* So called in Prof. E. Forbes' valuable paper "On the Geological Relations of the existing Fauna and Flora of the British Isles." Vide *Memoirs of the Geological Survey, &c.*, vol. i. p. 407.

† Geological Transactions, 2nd ser. vol. vi. pl. 16. figs. 5 and 6.

‡ *Ibid.* p. 137.

§ *Ibid.*

|| By the expression "deep water" must be understood a depth ranging from forty to eighty fathoms. The greatest depth given in Norrie's Chart of

tion from the nature of the object it grows upon*," there is a probability that it may be a variety of this species. It is nine inches long, branched, flattened, dense and incompressible, attached to a specimen of *Fusus islandicus*, and of a dirty light brown colour. Only one side, which is slightly convex, has orifices; these, as in *Halichondria ficus*, are "very few, small and scattered:" the opposite side is flat, and has evidently rested on the ground; at least it is impossible to conceive that the *Fusus islandicus* could support so large and heavy a sponge in an erect position. It was brought up by the lines from deep water off the coast of Northumberland.

RETEPORA BEANIANA†, nobis.

Specific Character.—Coral white, cup-shaped when young, afterwards irregularly and deeply folded; adhering to foreign bodies by a very short stalk; with meshes and interstices similar to those of a perforated strainer. *Meshes* longitudinally oval, a little narrower than the interstices, and somewhat quincuncially arranged. *Inner surface* of the coral celliferous. *Cells* (polypidoms) tubular, and arranged in linear series, of which from four to six occupy the width of an interstice. *Cell-apertures* in quincunx order, which is only slightly broken by the meshes: *upper lip* with an intumescence having a medio-longitudinal fissure: *under lip* with a central tubular process having a round terminal opening: *sides*, each with a long slender hollow spine. *Front wall of the cells* transversely convex, and with one or two foramina of the same diameter as the tubular processes. *Outer surface* of the coral marked with irregularly flexuose and anastomosing lines running somewhat longitudinally. *Polyps* of a red colour.

Dr. Johnston and others have considered this coral to be identical with the Mediterranean *Retepora cellulosa*, but after an examination of the characters of each, I have been led to conclude that they are distinct species. In the Mediterranean coral the interstices of the celliferous surface are furnished with strong hook-shaped processes curving upwards—generally two on each side of a mesh, but nothing of the kind is seen in the British species; and the under lip of the cell-apertures is not provided like the latter with a tubular process. Further, *Retepora*

the North Sea for the trough separating the coasts of Northumberland and Durham from the Dogger and Great Fisher banks seldom exceeds eighty fathoms.

* Dr. Johnston's British Sponges, &c., p. 146.

† I feel much pleasure in naming this coral after Mr. Bean, who was the first to discover it in the British seas (vide Loudon's Magazine of Natural History, vol. vii. pp. 638 and 639).

cellulosa has the meshes generally wider than the interstices; in *R. Beaniana* they are not so wide. These differences are not the result of age, as they prevail in old and young specimens of both species; probably there may be other differences which can only be detected by a powerful microscope. In other respects, the British coral seems to be closely related to the one living in the Mediterranean. My specimens of *Retepora Beaniana* are from deep water off the coast of Northumberland*.

From an examination of a specimen of the Shetland *Retepora* in the Newcastle museum, I have very little doubt that it is the same species as the one found on our coast.

HYPOTHYRIS PSITTACEA (genus, Phillips) = *Terebratula psittacea*, auct.

Notwithstanding it having been stated that this shell has been found at various places on the British coasts, there seems to be still some doubt on the mind of many conchologists that it is really a native of our seas. My specimens, one of which is as large as any that I have seen from the Arctic seas, were brought up from a depth of thirty fathoms, twenty-five miles from the north coast of Northumberland; they were dead specimens, and hanging to the byssus of a *Modiola vulgaris*. Mr. Maclaren has found it on the Berwickshire coast attached to the lines of the Coldingham fishermen†. My reasons for placing this shell in the genus *Hypothyris* are given in the July Number of the 'Annals of Natural History.'

PECTEN STRIATUS, Müller = *Pecten Landsburghii*, Forbes.

My specimen measures $\frac{7}{8}$ ths and $\frac{1}{16}$ th by $\frac{5}{8}$ ths and $\frac{1}{16}$ th, and was dredged in thirty fathoms water, thirty-five miles east of the south part of the coast of Northumberland. I have every reason to believe that it is not only specifically new to our coasts, but that it has not hitherto been found on the east coast of Britain.

CRENELLA DECUSSATA = *Mytilus decussatus*, Montagu.

I have a single specimen of this shell from the deep water of our coasts; it was lying in a cavity of a small stone brought up by the fishing-lines. Fabricius says that the *Crenella* (*Mytilus*) *faba*

* This coral was dredged in about sixty fathoms water off our coasts by Mr. Richard Howse of Sunderland, who went on a dredging excursion the week after mine. At the same time he dredged at about the same depth a live specimen of *Fusus barvacensis*, Johnston, an inch long, two nuchal capsules of *Fusus norvegicus* (an account of which is given hereafter), a live specimen of *Solen pellucidus*, a few specimens of *Astarte damnonia*, *A. scotica*, *Spatangus purpureus*, *Ophiura*, Corallines, &c. As in my case (which is now the third), he also encountered a heavy gale, which prevented the dredge being put down more than five times.

† Proceedings of the Berwickshire Naturalists' Club, vol. i. p. 213.

of Müller, an allied species, "inhabits the rocks of the sea, fixing itself by a copper-coloured byssus."

CRENELLA NIGRA = *Modiola nigra**.

The specimens which I have got of this shell on our coasts are very different in colour from those found in the Frith of Forth: when $\frac{1}{2}$ ths of an inch long they are of a brownish green colour; when an inch and three-quarters they are chestnut-brown; another difference obtains in the striæ, which are much finer on the Northumberland specimens than on those from the Forth.

The generic name which has been given to the two last shells requires a few observations. After examining the characters of the species which served as the type of Capt. Brown's genus *Crenella*, and comparing them with those of the so-called *Modiola marmorata*, *M. nigra*, *M. sulcata*, &c., I have been led to the conclusion, that these shells cannot be generically separated from *Crenella decussata*.

As regards external form, though the difference is great between *Crenella decussata* and *C. nigra*, yet how are we to distinguish the former from *C. faba* and *C. (Modiola) glandula*, Totten, which run completely into the latter? and as to the crenulated hinge-plates of *C. decussata*, they are to be seen, though generally less developed, in all the species that have been quoted.

In separating these shells from *Modiola*, I have been influenced more by the example of others than by any opinion of my own. Considering them as a single group, they have at various times been differently named: it would appear from Swainson that Humphreys distinguished it by the name of *Lanistes*†; in the 'Synopsis of the British Museum' they appear to be named *Modiolarca*; Swainson calls them *Brachydontes*; and Beck designates them *Modiolaria*. Mr. J. E. Gray even goes so far as to make a distinct family for them under the name of *Crenellidæ*, which "differs from that of *Mytilidæ* (*Mytilus*, *Modiola*) in the mantle lobes being united together so as to leave only two posterior holes for the entrance and exit of the water, and a slit for the foot and beard‡." It is possible I am in error as to the species which Mr. Gray places in the genus *Modiolarca*; it may be mentioned however, that in *Crenella (Modiola) marmorata* and *C. (M.) nigra*, there are, as in *Modiola vulgaris*, a long slit and only one "posterior hole;" the latter for the egress current, and the former for both the ingress current and the foot: in *Crenella marmorata*, owing to the anterior adductor muscle being strap-shaped, and extending unusually backward, the slit actually occupies the pos-

* Vide Montagu's Supplement, pl. 26. fig. 4.

† This name does not occur in Humphreys's Catalogue.

‡ Synopsis of the British Museum.

terior half of the shell, which I suspect is the same in *C. faba*, as its anterior muscular impressions are, in proportion, equally as elongated as those of *C. marmorata*. Notwithstanding there being so little difference between the animal of *Crenella marmorata* and that of *Modiola vulgaris*, I am somewhat in favour of generically separating the two groups represented by these species, as they may be readily distinguished from each other by the shells of the one being for the most part externally striated and having generally crenulated hinge-plates, and those of the other being externally smooth and possessing plain hinge-margins. If the generic value of the former group be admitted, the law of priority requires us to adopt Capt. Brown's name *Crenella* for it, while that of *Modiola* must be restricted to the latter.

LEDA MINUTA = genus *Lembulus*, Leach = *Nucula*, auct.

This species is rather rare on our coasts, and is generally brought up from a depth of from twenty to forty fathoms: my largest specimen measures $\frac{5}{8}$ and $\frac{1}{16}$ by $\frac{5}{8}$ ths of an inch.

With the exception of Dr. Leach and Mr. J. E. Gray*, none of our British conchologists have thought it necessary to separate generically the rostrated *Nuculas* from the rounded ones, which is remarkable, considering the two kinds differ from each other in more respects than that of external form. The rounded *Nuculas* have an iridescent inside and an entire pallial line, whereas the rostrated ones are of a milky hue internally, and the pallial line has a more or less deep sinus: this difference in the pallial line indicates that the animal of the latter is furnished with siphons, as first pointed out by P. C. Möller†, and that the animal of the former is without them‡. Considering these differences, it cannot but be admitted that the genus *Leda*, which Schumacher long ago proposed for the rostrated *Nuculas*, ought to be adopted: *Lembulus* is Dr. Leach's name for the same group, but as it appears never to have been published, except by other parties and at a date subsequent to the publication of Schumacher's, it necessarily falls to the ground.

Besides *Nucula* and *Leda*, another genus has been proposed by

* Since writing the above, I have read with pleasure Professor E. Forbes' remarks on this genus. Nearly two years ago, I had a paper prepared on a new genus for the *Nuculas* with a pallial sinus, which would have been sent to the 'Annals' but for accidentally finding among some packing-paper of a German book parcel a copy of the first number of Dr. Menke's 'Zeitschrift für Malakozoologie,' which made me acquainted with the fact that I had been anticipated both by Schumacher's *Leda* and Möller's *Yoldia*.

† Index Molluscorum Grœnlandia.

‡ Mr. R. Garner groups *Nucula* with the shells which have "a mantle without separate orifices or tubes" (vide Transactions of the Zoological Society, vol. ii. p. 101); but *Nucula margaritacea* has a pedal, an ingress, and an egress orifice.

Möller under the name of *Yoldia* for those *Nuculas* which agree with the last in being furnished with siphons, but which are thin, gaping, and of an oval form. From *Yoldia* we pass with little difficulty into *Solenella*—a genus whose affinities appear never to have been properly understood: the principal difference between *Solenella* and *Yoldia* is in the situation of the cartilage, which in the former is external, while it is internal in the latter; but this difference does not constitute any serious objection to an intimate relationship existing between these genera, since the like difference occurs even in *closely related* species of the same genus; for example, *Lucina divaricata* has an external cartilage, while *L. undularia**, Wood, has one that is decidedly internal.

There can be little or no doubt that *Nucula* and *Leda* are closely related to each other; hence we have another case, besides the one founded on the relation of *Iridina* to *Anodonta*, as first pointed out by Deshayes, “considerably invalidating the established rule†” that would compel us to include in one great family, the *Inclusa* of Cuvier, all those shells with “the mantle open at the anterior extremity, or near the middle, for the passage of the foot and extending to the other end in the form of a double tube.” To carry out such a rule would be to group together the most heterogeneous forms, and to widely separate those intimately related to each other by affinity: the genera *Unio*, *Anodonta* and *Margaritana*, which have the mantle open from front to back, ought in such a case to be placed near the *Monomyarians*, while *Iridina* and *Columba* (*Leila*, Gray?), Lea, which have all the characters, at least the last genus, of the *Enfermés*, ought to be collocated with the *Solens*, *Myas* and *Panopæas*.

ASTARTE SCOTICA, Montagu.

This species is somewhat rare on our coasts, where it occurs in deep water. The principal character which distinguishes it from *Astarte damnoniæ* is the plainness of the margins: I have a specimen however with the basal margins plain, but whose posterior and anterior margins are crenulated. Generally the inside of the valves, as well as the animal, are light-coloured, but occasionally they are red; it is the same with *Astarte damnoniæ*.

* Mr. Searles V. Wood places this interesting shell in the genus *Loripes* (vide *Annals of Nat. Hist.* vol. vi. p. 247), but its resemblance to *Lucina divaricata* plainly shows, that if this were agreed to, we should break one of the most obvious links of affinity, and group together shells not so closely related. The change of position of the cartilage is, I am inclined to think, to be seen in other closely allied species of *Lucina*; if so, the genus *Loripes* would be far from a natural one.

† Animaux sans Vertèbres, 2nd ed. tome vi. p. 572, &c.

AXINUS FLEXUOSUS = genus *Cryptodon*, Turton = *Ptychina*, Philippi = *Lucina*, auct.

This shell appears to be much rarer on the east than on the west coast of Britain. Professor Macgillivray has found it off Aberdeenshire, and Mr. Maclaren has procured it on the Berwickshire coast. I have only seen a single specimen belonging to Northumberland, and that came up on the lines after they had been down in thirty fathoms water, twenty-five miles east of the Fern Islands.

If this shell *must* be separated from the genus *Lucina*, it will have to be named *Axinus* instead of *Cryptodon*, as the former name was previously applied to an allied or congeneric fossil (*Axinus angulatus*) belonging to the London clay, Mr. J. Sowerby having published the genus so designated in December 1823 (the date of No. 55 'Mineral Conchology,' in which it first appeared), while that of *Cryptodon* was not published till the early part of the following year (vide the dates of the dedication and title-page of Turton's 'British Shells')*.

MYZIA UNDATA (Leach's genus) = *Venus undata*, Pennant.

I dredged a specimen of this shell in fifty fathoms, but it is also to be found in much shallower water, as it is occasionally taken on the lines that have been down in twenty and thirty fathoms. *Myzia undata* and *Diplodonta rotundata* have often been placed in the same genus: the sinus in the pallial line of the former, however, generically separates it from the latter, which is one of the *Lucinide*.

MYA TRUNCATA, Linnæus.

Variety *M. pelagica*, nob. This variety is from deep water off the coast of Northumberland: it resembles the ordinary form of *Mya truncata*, but is more truncated posteriorly, approximating in this respect to *Mya uddevallensis*; but instead of the truncation being oblique as in the latter, it is perpendicular as in the former. Further, *Mya pelagica* agrees with the normal form of *Mya truncata* in the curve of the pallial sinus, but differs from it in the position of the posterior adductor muscular impressions,

* Mr. J. Sowerby included in the genus *Axinus* a very different shell belonging to the magnesian limestone—the so-called *Axinus obscurus*, for which and some mountain limestone species I have formed the genus *Schizodus* (vide Sir Roderick Murchison's *Geology of Russia*, vol. ii. p. 308). Professor E. Forbes, in stating that this shell "was the type of the Sowerbian genus *Axinus*" (vide vol. i. *Memoirs of the Geological Survey*, p. 412), overlooks the express declaration of Sowerby himself, that the London clay species (*Axinus angulatus*) was to be considered the type of this genus: this shell is also the one first described.

which are situated close to the edge of the posterior end of the shell, as in *Mya uddevallensis*. Young specimens of this variety are likewise more truncated than those of the same age of the normal form. I have seen specimens brought up from a depth of thirty fathoms intermediate between *M. pelagica* and the latter.

PANOPÆA ARCTICA = *Glycimeris arctica*, Lam.

I have much pleasure in recording this interesting shell as an addition to our local fauna. Mr. Bean has procured it on the Yorkshire coast: my specimens are from both the Northumberland and the Durham coast, where they were brought up from deep water. My largest specimen measures $3\frac{1}{4}$ inches by $2\frac{1}{4}$. It is a somewhat variable shell on our coasts, but apparently not more so than it was in the Mediterranean during the pleiocene period.

RIMULA NOACHINA = genus *Cemoria*, Leach = *Sipho*, Brown = *Puncturella*, Lowe.

I dredged a live specimen of this shell in fifty fathoms water, sixty miles to the east of the north coast of Durham. The species (*Rimula Blainvilli* and *R. fragilis*) on which this genus was founded do not differ generically from our local one; I have therefore been induced to adopt the earlier name of DeFrance in preference to that of Leach.

TROCHUS MILLEGRANUS, Philippi.

Only a single specimen of this beautiful shell has fallen into my hands; it was brought up by the lines from deep water off the coast of Northumberland.

SCALARIA TREVELYANIANA.

This species is only rare on our coast: a single dead specimen came up in the dredge from a depth of fifty fathoms. My largest and best specimen is $\frac{7}{8}$ ths of an inch in length, and is of a brownish flesh-colour.

NATICA GRÆNLANDICA, Beck.

Mr. Bean was the first to extend the geographical range of this shell to Britain: he finds it on the Yorkshire coast. Besides procuring it from the boats that fish on our coasts, I have dredged it alive in fifty fathoms. The animal is of a milk-white colour, and resembles that of *Natica Alderi* in form, but *apparently* it is not furnished with tentacles; I had it alive for a few hours, during which time it was very active, but either through not wishing to gratify me, or not possessing them, it never showed any trace of these appendages.

FUSUS ANTIQVUS, Müller.

The coasts of Northumberland and Durham afford two

strongly-marked varieties of this well-known shell, apparently consequent on the depth at which they live: thus the variety found in from fifteen to twenty fathoms water is thick and elongated, and the one procured from the greatest depths is thin, short and tumid. On contrasting these two varieties, many would pronounce them to be distinct species; but they are completely blended by a form which lives at an intermediate depth—about forty fathoms. The shallow-water variety, as it may be called, resembles the specimens figured in Capt. T. Brown's 'British Conchology,' 2nd ed. pl. 6. f. 8; Pennant's 'British Zoology,' vol. iv. pl. 78; and Donovan's 'British Shells,' vol. ii. pl. 31. My largest specimen is $6\frac{1}{2}$ inches in length and $3\frac{1}{2}$ in width, and has nine whorls.

I do not know of any published figure that represents the deep-water variety; perhaps the best idea of its form will be conceived from the following measurement of a median size specimen, which is $5\frac{1}{4}$ inches long and $3\frac{1}{2}$ wide, and has eight whorls; to which I may add, as general in the variety, that the whorls are extremely ventricose, that the siphon or canal is strongly twisted, and that when old the outer lip is very much reflected.

The largest specimen I have got, and which is now in the cabinet of Mr. J. Alder, is 7 inches in length and 5 in breadth, and has nine whorls.

The only figure I can find to illustrate the intermediate form is in Müller's 'Zoologica Danica,' pl. 118. fig. 1. My largest specimen measures 7 inches by $3\frac{1}{2}$, and has eight whorls. I have specimens approximating closely to *Fusus carinatus*.

FUSUS NORVEGICUS = *Strombus norvegicus*, Chemnitz.

The only British locality hitherto published for this species is the Yorkshire coast. I have procured it both from the coast of Northumberland and of Durham, where it lives in deep water. Although figured in the great work of Chemnitz, it is surprising that so few conchologists, continental or British, were aware of the existence of this shell until Dr. Turton announced it as having been found by Mr. Bean of Scarborough; a reduced copy of Chemnitz's figure is given in Wood's 'Index Testaceologicus.'

Fusus norvegicus differs decidedly from *Fusus antiquus*, with which it has occasionally been confounded: the canal is shorter and wider; the apical or nucleate whorls are considerably larger, being as large as in some of the mammillated Volutes; and the inner lip is much more expanded, being spread over the ventral convexity of the body-whorl considerably beyond its median line; further, it is much smoother externally, is more highly polished internally, and has a shorter spire; nor has it the siphonal ridge of *Fusus antiquus*.

The colour varies according to age ; in young specimens the aperture is simply fawn-coloured, but in those fully grown it is tinted with bluish pink ; the outer surface is fawn-coloured. The epidermis is of a light brown colour, but owing to its thinness is seldom preserved except in patches. When old, the outer lip is considerably spread out, which gives the shell a striking resemblance to some Volutes, particularly *Voluta magnifica*.

Before the young shell is excluded from the nidamental capsule, which contains from two to three individuals, it is a most beautiful object, resembling in its amber-like appearance some of the Succineas ; the capsules are similar to those of *Fusus antiquus*, but they are larger and not like them piled on each other, but agglutinated separately by a marginal expansion to the inside of dead shells. My largest specimen of *Fusus norvegicus* is $4\frac{1}{2}$ inches in length and $2\frac{1}{4}$ in breadth, and has six whorls : a full-sized embryo specimen is half an inch long and a quarter broad.

Although I have had a specimen alive of this shell, I have not seen the animal in action : the sides of its foot are marked with dark purple blotches ; the mantle on the columellar side is very much thickened, which allows of its being extended over the ventral part of the body-whorl, as indicated by the wide expansion of the inner lip ; and the organ homologous with the so-called *muco* of the penis of *Buccinum undatum* is very much produced and strikingly resembles the spiral of a cork-screw ; following the spiral it measures one inch and $\frac{5}{8}$ ths in length. I have not yet seen the male organ of *Fusus antiquus* ; I am therefore unable to make any comparison between it and the corresponding part of *F. norvegicus*. The operculum is very small and somewhat ovate.

FUSUS TURTONI, Bean.

This species and the preceding one are undoubtedly the most beautiful of the large shells inhabiting the British seas. Considering this circumstance and their extreme rarity, it may be readily imagined that I feel some degree of pleasure in recording them as natives of our coasts.

Fusus Turtoni may be readily distinguished from *Fusus antiquus* and *F. norvegicus* by its more elongated spire, smaller aperture, thicker epidermis, and the more truncated form of its siphon. When young the colour of its aperture is reddish brown, which in full-grown specimens changes to a rich purple-brown, while the lip is of a pure glossy white. The epidermis is of a yellowish horn colour. The outer surface of the shell is light-coloured ; the whorls are marked with slightly elevated broadish spiral cords ; the apex is mammillated, but not so much as it is in *F. norvegicus* ; the outer lip in full-grown specimens is thickened and reflected, while the inner one is somewhat more expanded than

that of *F. antiquus*; and the operculum is large and pyriform. My largest specimen measures 5 inches in length and $2\frac{1}{8}$ ths in breadth, and has eight whorls. It is found at the same depth and in the same places as *Fusus norvegicus*.

I am strongly inclined to think that the Uddevalla fossil figured in Hisinger's '*Lethæa Suecica*' (tab. 37. 2nd Supplement) under the name of *Buccinum anglicanum*?, if not a variety of *Fusus Turtoni*, is a nearly allied species. If its spire were a little more elongated and the canal a trifle more produced, Hisinger's shell would closely resemble the latter: for a certainty it is not a *Buccinum*, as it wants the well-developed siphonal ridge of this genus. In the form of the lower part of the columella, the Uddevalla fossil offers a striking resemblance to *Fusus Turtoni*.

FUSUS ISLANDICUS, Martini.

There are two varieties of this shell on our coasts: one from shallow water and similar to the specimens represented in Capt. Brown's '*British Conchology*,' 2nd edit. pl. 6. figs. 7 and 9, and Donovan's '*British Shells*,' vol. ii. pl. 38, being thick, long and narrow; and the other, which is from deep water, is thinner, shorter, and more tumid. The spiral lines are stronger, and more apart from each other on the elongated than on the tumid variety, and the canal is generally more twisted on the latter. The tumid variety appears to be intermediate in many respects to the elongated form, and the *Fusus ventricosus* of Gray found on the banks of Newfoundland.

The shell represented in Brown's '*British Conchology*,' 2nd ed. pl. 6. figs. 11 and 12, appears to belong to the tumid variety, but none of my specimens are so short in the canal. My largest specimen of the tumid variety is $3\frac{1}{2}$ inches in length and $1\frac{1}{2}$ in breadth, and has nine whorls.

FUSUS BERNICIENSIS, nobis*.

Specific Character.—Length rather more than twice the breadth (the largest specimen I have got, and which appears to be a full-grown one, is $3\frac{1}{8}$ inches long and $1\frac{1}{2}$ broad, and has eight whorls). *Spire* (measuring from the apex to the suture at its junction with the outer lip) nearly half the length of the shell. *Aperture*, including the canal, pyriform. *Siphon* evenly rounded, slightly twisted, and tapering towards its termination; its greatest breadth half that of the aperture, and its length five-thirds of its breadth: columellar side not much thicker than the opposite one. *Outer lip* rather thickened, somewhat reflected and slightly sulcated,—the sulcations corresponding to

* From Bernicia, the name of the kingdom founded by Ida, and embracing the present counties of Northumberland, Durham, &c.

the largest of the cords on the outside of the shell. *Inner lip* expanded over the ventral part of the body-whorl to nearly its median line. *Whorls* ventricose, with numerous prominent spirally arranged cords, a large one (the thirty-second of an inch in size on the body-whorl) alternating with a smaller one (half the size of the other), and separated from each other by an interspace or furrow equal in width to one of the latter; occasionally a thread-like line runs along the interspaces: the cords are crossed by slightly elevated lines of growth at the distance of one of the spiral furrows from each other, which gives the surface of the shell rather a decussated appearance. *Colour* white. *Epidermis* thin and horn-coloured. [Animal and operculum unknown.]

This shell is undoubtedly allied to a group of species represented by *F. islandicus*, but it differs from all those that have been described in some of its characters, such as the prominent spiral cords, the wide expansion of the inner lip, the form of the siphon, &c. In the spiral cords it bears a resemblance to *F. striatus*, Sow. (particularly the specimens figured in the 'Mineral Conchology,' pl. 22, if they were furnished with a smaller cord running between those that are represented): in the expansion of the inner lip it offers an approximation to *F. norvegicus*, and consequently differs from *F. islandicus*, which has the same part as little expanded as in *F. antiquus*; and in the form of the siphon (that is, its tapering off towards the extremity) it resembles *F. antiquus*, and thereby differs from *F. islandicus*, the siphon of which preserves the same width throughout its entire length. *Fusus islandicus*, though without a siphonal ridge, so prominent in *Fusus antiquus*, evidently displays a tendency to form one; but in *F. berniciensis*, owing to the evenly rounded form of the siphon and the thinness of its columellar side, there is no appearance of such a tendency. To the *Fusus Sabinii* of Gray* our shell appears to bear some resemblance; but it is much to be regretted, that the smallness of the specimen examined by Mr. Gray will not allow of a rigid comparison between it and those of *F. berniciensis*, the most perfect of which is four times as large. From the description of *Fusus Sabinii*, I am led to believe that *F. berniciensis* is more strongly ribbed, that its aperture is of a different form, that its siphon is longer, and that its lines of growth are not so prominent.

The deep water on the Northumberland coast has yielded me two specimens of this interesting species. Should I ever be so fortunate as to procure a live one, I will endeavour to complete its specific character.

* Vide Supplement to Capt. Parry's Arctic Voyage in the years 1819-20, p. cxxl-cxxli.

BUCCINUM UNDATUM, Linn.

The coasts of Northumberland and Durham yield four distinctly marked varieties of this shell, three of which it is my intention to consider separately, and under the following names: *Buccinum magnum*, *B. littoralis* and *B. pelagica* *.

Variety *Buccinum magnum*.—The nearest representation I can find of this variety are the figures in the 'Encyclopédie Méthodique,' (pl. 399. fig. 1 a—1 b). My largest specimen measures $4\frac{1}{2}$ inches in length and $2\frac{1}{4}$ ths in breadth, and has nine whorls. The spirally corded character of this variety is very striking (though none of my specimens are quite so strongly corded as the figure just referred to): on the body-whorl the cords are generally an eighth of an inch apart, but in some specimens they are separated from each other to the extent of a quarter of an inch: the intermediate furrows are occupied with from three to six threads.

The canal is short and wide, and both sides are of equal length, and its terminal margin is strongly reflected. The waves are rounded; and it is rare to see them becoming obsolete even on the body-whorl of the largest specimens. The outside of the shell is generally yellowish or reddish white, and the inside is of a milk-white colour. The epidermis is thick, clothly, and of a dirty brown. This variety lives at depths varying from fifteen to forty fathoms, and from its epidermis being generally dirty, there

* There are now so many names given to shells generally considered to be merely varieties of *Buccinum undatum*, that I was in hopes of using some of them for those described in the text. I find however that this is impracticable: for example, *Buccinum striatum* is generally considered to represent the thin or deep-water form, but the shell which Pennant describes under this name (vide British Zoology, vol. iv. pl. 74. fig. 91), as remarked long ago by Dr. Turton (vide British Fauna, p. 171), is "without the undulate ribs;" in short, it does not possess the specific characteristic of *Buccinum undatum*—the waves; it is simply longitudinally plicated. As this is not general (exceptions occasionally occur) to any of the varieties on our coasts, I am consequently prevented using the name "*striatum*." With reference to the name *Buccinum Donovanii*, Gray, this has been given to a shell which I am disposed to think is merely an elongated form of my *B. pelagica*, and which occurs only rarely on our coasts: in other localities it may be a more general form; if so, the name may therefore be advantageously retained for it. As to the name *Buccinum anglicanum*, I confess my inability to decide as to what shell it was originally given. On the whole then it seems preferable to make use of new names when there are so many difficulties in the way of adopting the old ones. I am not certain that my names can be applied to varieties found in other localities: the *Buccinum undatum* sold in London is different from the varieties that I have described: I have a beautiful specimen from some part of Ireland very different from any on our coasts; it has the waves, but it is decidedly without the spiral cords, being simply striated. I have seen specimens from other localities that cannot be identified with our varieties.

can be little doubt that it lives on a muddy bottom : the largest and thickest specimens are from the shallowest water. The Newcastle museum possesses an aberrant form of this variety without the least trace of waves, and resembling the *Buccinum carinatum* of Turton.

Variety *Buccinum pelagica*.—In speaking of the last variety it was stated, that the thickest specimens were from the shallowest water, that is from fifteen to twenty-five fathoms, and, as implied, that the thinner kinds were from a greater depth, say from twenty-five to forty fathoms : the same variation is observable in the variety under consideration ; the thickest specimens are to be found in from forty to fifty-five fathoms, while the thinnest live in from fifty-five to eighty fathoms. In short, there is an unbroken gradation of character from the very thick shell found in fifteen fathoms water to the excessively thin one which has its habitat in eighty fathoms : but how different is their appearance when they are contrasted ! take for example a full-grown specimen of each variety from the extremes of depth.

Buccinum magnum var.
4½ inches long, 2½ inches broad.
Nine whorls.
¾ths of an inch in thickness.
Spiral cords and threads prominent and persistent.

Epidermis thick and clothly.
Waves large and on all the whorls.

Both sides of the siphon of the same length.
Weight 3½ ounces.

Buccinum pelagica var.
4½ inches long, 2 inches broad.
Ten whorls.
¾th of an inch in thickness.
Spiral cords and threads small and becoming obsolete on the large whorls.

Epidermis thin and ciliated.
Waves small and only on the first six whorls.

The columellar side of the siphon much shorter than the opposite one.
Weight ¼ an ounce.

I have not yet procured any specimens of *Buccinum pelagica* without the waves and simply threaded, as appears to be the case with the *Buccinum ciliatum* of Fabricius, but I have some closely approximating to this species in these respects : in a few of my specimens the waves lose their peculiarity, and become simple longitudinal plications, not in the least undated. If *Buccinum ciliatum* occurred on our coast, I should be strongly inclined to regard it as another variety.

Buccinum pelagica has a strong tendency to become elongated : I have specimens closely resembling the shell figured by Donovan as the *Buccinum glaciale* * (the same shell has been named *Buccinum Donovanii* by Mr. J. E. Gray). Its colour is extremely variable, being externally white, variously shaded with brown, yellowish, and often marked with two or more reddish brown or purple bands : owing to its thinness, the outside colours are often

* British Shells, pl. cliv.

displayed on the inside of the aperture; occasionally there is so little calcareous matter in the shell that it is almost horny.

Variety *Buccinum littoralis* is so called in consequence of only being found close in shore on pebbly bottoms and rocks laid bare at low tide. From being on such rough and exposed grounds, it is extremely liable to become broken and abraded, which will account for so few being found in a perfect state: at one locality near Sunderland, it is however often found in beautiful condition; here the specimens are always white externally with a yellow aperture: in various other localities on the coast of Northumberland, it is brown externally, and of a variously shaded purple colour within. This variety, at least as it occurs near Sunderland, has the waves rounded, regular, and not very prominent: the cords and threads are closer to each other than in *B. magnum*, from which it differs in being a shorter and a smaller shell, in having a shorter spire, the whorls standing less boldly out from the sutures, and the terminal margin of the canal less reflected. The epidermis is thinnish and of a light brown colour. My largest specimen measures $2\frac{7}{8}$ inches in length and $1\frac{1}{2}$ in breadth, and has eight whorls; it is very seldom that specimens are found exceeding this size.

Besides the foregoing, another strongly marked variety occurs on our coasts; but as it is probable it will be described elsewhere by others who have paid more attention to it than I have, I shall merely state, that one of the principal differences between it and *Buccinum magnum*, as first pointed out to me by Mr. A. Hancock, is in the general absence of an epidermis; the fishermen say that it lives on hard or rocky ground. The figure in Pennant's 'British Zoology,' pl. 73, appears to represent the same shell. I have seen two aberrant forms of this variety; one is thin, waveless and subulate, somewhat resembling the *Buccinum acuminatum* of Broderip; and the other is of the normal form, but without any waves.

To the conchologist who is interested in the modifications to which a species is subject from a variation of habitat, depth, or from other causes, nothing can be more pleasing than to see the various permanent forms of *Buccinum undatum* belonging to our coasts; but how much more interesting would a collection be of all the varieties that are known to live under every shade of climatal influence! Deshayes says that *Buccinum undatum* is found ranging "from the North Cape to Senegal, modifying itself according to the temperature as it advances*:" it is well known to occur on the shores of North America; and the palæontologist is certain that it lived as far back as the meiocene period. I have

* Charlesworth's Magazine of Natural History, vol. i. p. 10.

endeavoured to describe some of the modifications of this species as they occur at the present point of time on the coasts of Northumberland and Durham; let us hope that others will be induced to describe more of its modifications as prevailing on these coasts and elsewhere during either the present or an earlier period. If this should be done to a proper extent, it is not too much to anticipate that sufficient materials will be accumulated to necessitate the publication of an illustrated monograph of the species *Buccinum undatum*.

XXVII.—*The Birds of Calcutta, collected and described by*
CARL J. SUNDEVALL*.

[Continued from p. 176.]

17. *Phenicornis flammea*, Boie.—*Musc. flammea*, Forster, Lath. Temm. Pl. Col. 263.

Alarum tectricibus quibusdam pennisque posticis apice flavo-limbatis. Rostri carina paullo obtusa.

♀ (Calcutta 22 Febr.) cinerea, uropygio concolori; subtus pallide flava, gula albida; linea per oculos fusca, supercilia albida. Ala nigra, vitta flava e fascia remigum 5, et sequentium. Tectrices inferiores et margo carpi flava. Cauda prioris. Rostrum et pedes nigri. Long. $7\frac{1}{2}$ poll., ala 87 millim., tarsus 14, rostrum e fronte 12; altitudo 5, latitudo 7. Iris fuscescens. (Alia simillima, rectricibus utrinque 5 apice flavis, e Calcutta, Mus. Stockh.)

♂ junior (e Calcutta, Mus. Stockh.), ut ♀ sed subtus sordide coloratus, collo antico parum flavo tincto. Uropygium leviter flavo-tinctum. Flavedo caudæ splendidior. Ala 88 mill.

♂ adultus e Java, superne cum gula et jugulo niger, cæruleo nitens; subtus uropygio, vitta alarum caudaque lateribus splendide luteo-fulvis. Rectrices utrinque 5 extrorsum luteæ. Mensuræ ut ♀.

I saw only the described hen-bird without being able to examine its actions, &c. closer. It had insects in the stomach, and in its cellular texture under the belly-skin lay two pretty large intestinal worms (*Ascarides*). The ovary was quite visible, but small.

17 b. *Phenicura miniata*? Temm. Pl. Col. 156.

♂ Junior? e Calcutta, Mus. Stockh. Cinereus, subtus cinerascens-roseus, gula alba. Ala nigra, fascia remigum, apicibus tectricum majorum pennarumque posticarum, et parte exteriore rectricum 5 lateralium late rubris (roseis). Uropygium rubro (nec flavescens) tinctum. Ala 87 millim., tarsus 14. Simillimus mari juniori prioris, colore flavescens in rubrum mutato†.

* Translated from the 'Physiographiska Sällskapets Tidskrift' by R. Bertram, with Notes by H. E. Strickland, M.A.

† This bird is the *Pericrocotus roseus* of Vieill., and not the *miniatus* of Temminck.—H. E. S.

18. *Acanthiza trochiloides*, n. Olivaceo-viridis, subtus alba, antice flavo tincta. Cauda integra penna extima brevior, apice intus alba. Linea per oculos fusca.

♂ 15 Febr. Caput paullulum fusco tinctum; supercilia elongata pallide flava. Ala subtus alba; tectrices superiores apice pallescentes. Cauda fuscescens, obsolete transversim undato-micans. Rostrum subtus album, superne et pedes pallide fusci. Long. 5 poll.; ala 47 millim., tarsus 19, cauda 45, rostrum e fronte 9. Rostrum apice leviter compressum. Remiges 3 anticæ gradatæ: 2^a = 10^a; 4 et 5 reliquis longiores. Pennæ cubiti ad $\frac{1}{2}$ alæ flexæ extensæ.

This little bird has a greater interest for us on account of its remarkable resemblance to our *Sylvia trochilus*. I have only seen the above-described specimen, and can say nothing else about its way of living than that even in its actions it has an extraordinary resemblance to *Sylvia trochilus*, so that I fully believed I had found that species until an examination of its flattened, much broader beak, and the somewhat different-formed wings proved my mistake. These are the only points in which the genus *Acanthiza* (Vig. et Horsf.) differs from our *Sylvia*; the beak is even unlike that of our *S. hippolais*. In New Holland there are several species to be found. I heard no note from the bird described. This is most likely the kind to which those authors allude who speak about the Indian *Sylvia trochilus* (for example, Edwards in the text to plate 278).

19. *Acanthiza arrogans*, n. Superne olivaceo-viridis, subtus tota flava; vertice vittis 2 longitudinalibus nigris e rostro ad nucham.

♂ Calcutta, 9 Febr. Corporis latera flava. Alæ fuscæ, plumis virescenti-marginatis; pennis intus albidis. Rectrices utrinque 2, pogonio interno e medio ad apicem albo, omnes rectæ, apice angulatæ, unde cauda emarginata. Rostrum superne fuscum et pedes albidus. Magnitudo et statura *Reguli*. Longit. 4 poll.; ala 57 mill., tarsus 17, rostrum e fronte 10; altit. 2, latit. 4. Rostrum apice non compressum, maxillis æqualibus, superioris apice non deflexo. Remigum 1^a paullo brevior quam in præcedente; 5^a reliquis sublongior. Lingua sat magna, apice rotundata, integra.

This bird bears a considerable resemblance to our *Regulus*. I have met with it only twice, amongst bushes, in which it hopped about without being shy. The specimen described hopped actively about in a low tree without concealing itself, and screamed a rough *tshack! tshack!* as if it intended to drive me away. I could not find out how far it had begun to build its nest. In its stomach I found only small hard beetles. This bird also is called by the natives *Tuntuni*.

20. *Malurus longicauda*, Temm. Man. ed. 2. Anal. p. 48.—*Motacilla longicauda*, Gm., Lath. no. 144. *Sylvia guzurata*, Lath. 173 (ex it. Sonnerati).

Olivaceo-viridis, subtus cum gula albus, capite antèrius tibiisque fulvescentibus.

♂ rectricibus 2 mediis elongatis, linearibus dimidio longioribus quam proximis. ♀ rectricibus simpliciter gradatis, 6 mediis sub-æqualibus, coloreque paullo obsoletiore.

Magnit. *Troglodytis*; ala 46 mill., tarsus 20; rectrices mediæ maris 65, proximæ sequentes 44, fæminæ 39. Iris flavescens-alba, rostrum supra fuscum, subtus et pedes pallidæ. Capitis latera et supercilia griseo-albida, occiput fuscum. Rectrices fuscescentes, lateribus virides, margine apicis albido. (♂ ♀ Febr., Apr., Maio. Testiculis Apr. Maio tumidissimis.)

Lingua apice truncata, lacero-setosa ut *Pari*.

Just as the two before-described birds seem to represent our *Sylvia trochilus* and *Regulus*, so it seems that this bird supplies the place of our *Troglodytes* in India, to which it bears, the colour excepted, a close resemblance. Its much larger feet and smaller wings give it a strange appearance. Like *Troglodytes* it hops restlessly and boldly about, often, but not at all times, with its tail spread out, and is seldom quiet. It also seems often to make signs as if it would attack the person who approaches it; but it hops only in trees, generally in the lower ones, and not among stones, &c., as *Troglodytes*. Its note is a loud whistling *tshuti! tshuti!* I did not hear any clear sounds. According to a description in Lath. 'Gen. Hist.' it builds its nest between two leaves of the mango-tree. I found in its stomach only the remains of finely-chewed insects. In the entrails of both the males were found a great many intestinal worms as fine as threads in the neighbourhood of the kidneys, and it seemed as if the liver of one had been gnawed by them, yet the bird appeared to be quite lively and gay. Three of the males I examined were without those worms. The liver in all of them was of a whitish colour, which was quite common among the Bengal birds. This kind is common in the neighbourhood of Calcutta. It is met with all over India and China. In Java (and Sumatra?) there is a kind which is very much like this, and ought perhaps only to be considered as a variety*. Dr. Mellerborg, who visited Java in 1827, likewise through Baron Gyllenkrok's patronage, has brought several specimens of them, but only on his second visit.

21. *Iōra tiphia*. Supra viridis (vel nigra) subtus flava, fasciis alarum 2 albis; rostro valido nigricante, tomis late albis.—*a.* superne nigra: *Motacilla zeylonica*, Gm. = Sylv. zeyl. ♂ Lath. 91. *Le Quadricolor*, *LeVaill. Afr.* 141 (e Ceylon).—*b.* superne viridis: *Motac.*

* *Malurus sepium*; *Motacilla sepium*? Raffl. Sumatr. Linn. Tr. xiii. Fusco-olivaceus, subtus flavescens-albidus, capite antèrius cum lateribus gulaque tibiisque rufis. Rectricibus apice albis fascia ante apicem nigricante. Mensuræ, et differentia sexus ut *M. longicauda*, sed rostrum fortius, ♂ jugulo fusco-olivaceo.

tiphia, *Linna. S. N.* (ex icone *Edw.* 79=Ficed. bengalensis, *Briss.* iii. p. 484, e Bengal.). Figuier vert et jaune, *Buff.* *Sylvia zeylonica* ♀, *Lath.* Iōra scapularis, *Horsf. Jav. Linn. Trans.* xiii. p. 151. *Turdus scapularis*, *Raffl. Sumatr.* ib. p. 311.

Descr.—Var. *viridis* ♂ (Calcutta 28 Febr. testic. parvis) superne e fronte ad caudam flavescenti-viridis, opacus, uropygio fronteque paullo magis flavo tinctis. Plumæ dorsi basi cineræ medio obsolete albæ. Capitis latera cum orbitis, totumque gastræum flava, hypochondriis olivaceo tinctis. Alæ nigræ, tectricibus majoribus apice pure albis, unde fasciæ 2 albæ; carpi margo flavus. Remiges cubitales latius flavo, primariæ tenuissime albo marginatæ. Cauda pure nigra, pennis 2 mediis totis, reliquis margine apicis virescentibus. Pedes nigricantes. Iris fusca. Long. 5½ poll. Extensio alarum 7 poll. Ala 60 mill., cauda 51, tarsus 18, rostrum e fronte 15.—♀ (Calcutta 28 Febr.) similis mari, sed differt coloribus minus distinctis. Cauda tota olivacea, viridi marginata, transversim undatomicans, pennis utrinque 2 margine interiori tenui, virescenti, definito. Venter sordide flavus; alæ fusco-nigræ fasciis albis flavo inquinatis. Mensuræ ut maris. (Fœmina 7 Febr. et in medio Martii huic similima.)

Var. *superne nigra* e Java Mus. Gyll., ex "Ind. Or." Mus. Stockh. (veris ♂). Superne atra, nitida, plumis obiecta albis et flavis. Uropygium olivaceum. Capitis latera cum orbitis, collum antice totumque pectus flavissima, abdomen album. Alæ et cauda ut ♂ supra descr. Ala 63—66 mill.

Genericu.—Rostrum rectum validum crasse subulatum, subteres, longit. ¾ capitis, apice superiore inciso, vix deflexo, vixque longiori. Vibrissæ fere nullæ. Nares nudæ, membrana angusta, fornicata. Alæ breves, rotundatæ, remigibus 4—6 æqualibus, cubitales parum superantibus. Cauda mediocris, æqualis, integra. Pedes mediocres, scutati, pollice fere longit. dig. medii.

All the specimens I saw were of a green colour, and I am not aware that individuals of a black colour from Bengal have been described. The black specimens of Java which I have seen have not shown any dissimilarity that would warrant their separation into two species. Common as this bird was, I did not shoot any after the middle of March, nor have I noted down whether I saw any after that time. In February they seemed already paired, and when I shot the above-described male without killing it immediately, it remained hanging on a branch, and the hen-bird came directly and tried to help it up with its beak. As a matter both of feeling and of science, I was now induced to make their fidelity eternal by another shot. From the above-described anatomical proportion one is led to believe that this male was young, and that it was its mother which intended to assist it; but in that neighbourhood I found none but these two, which I had observed for more than an hour. In attitude and actions this bird resembles more a *Fringilla*, for example the Bulfinch. It hops

steadily about in the tree without the restless or prying actions which commonly belong to the insect-eating birds; but the formation of the beak is sufficient to distinguish it from the Sparrow-kind; the edges of the under mandible being rather high, and towards the end very much bent in. In its stomach I found small and hard beetles, and eggs of butterflies. The common decoy-note was a quickly repeated high and clear *pipipi-pipi!* or *tuj tuj tuj . . .!* From the male I often heard a very charming but soft singing which was greatly varied. The Bengalese name is unknown to me.

22. *Timalia grisea*.—*Turdus griseus*, Gm., Lath. no. 91 = Merle gris de Gingi, Sonn. Voy. (Huc etiam : Baniahbou de Bengale, Alb. 3. 8. pl. 9 (mala) = *Merula bengalensis*, Briss. 2. 260, Edw. t. 184 (colore nimis obscuro, pedibus debito minoribus et iride rubra); cit. sub *Turdo canoro* Auct.*)

Pallide grisea, subtus pallidior, leviter fulvescenti tincta; macula nuda pone oculos, rostro, pedibusque flavescenti-albis, remigibus intus fuscis.

Magnit. et statura *Turdi*, pedibus multo majoribus, alisque minoribus $9\frac{1}{2}$ poll., ala 102 mill., tarsus 35, cauda 100. Iris nivea. Plumæ laceræ, decompositæ, rachides in dorso obtecte albidæ; pectus et variæ partes, certo luminis situ obsolete fusco-micante maculata. Linea superciliaris nulla distincta. Vibrissæ minimæ, subreflexæ. Rostri et pedum forma similis *Graculæ*. Cauda valde rotundata, transversim undato-micans.

This kind is common near Calcutta, where in February and March I saw them in families of five or six together hopping about on the ground among small trees and bushes. When startled they flew into the lower trees. Their flight is quick with a noisy action of the wings, but it is feeble and never continued for any length of time. Like the Thrush-kind they hide themselves very cleverly behind the branches and leaves. They never remain quiet, and make a great disturbance with their chattering noise, which is somewhat like that heard from young starlings. From these sounds this species has received its Bengalese name *tshattaria* (with the accent on the first syllable), which is not at all a bad name for it. In Lath. 'Gen. History' (under *Turdus canorus*) the name of *Chatareea* is mentioned, according to the account of Buchanan. I did not hear any song. Its food consists of insects, small snails, grains of rice, &c., which I always found in its stomach. In the beginning of February I got a young

* Reliquæ citationes *T. canori* referendæ sunt ad *T. sinensem*, Briss. et L. (L'Hoamis de la Chine, Buff.) sc. *Turd. chinensis*, Osb. It. 309. *Corvus faustus*, Linn. Am. Ac. iv. *Lan. faustus* et *Turd. canorus*, Linn. S. N. x. et xii. Sic *T. canorus* = *T. sinensis*, nobis, *Timalia fausta*, e div. *Garrulax*, Lesson.

male, which had in the cavity of the chest, under the skin, between the branches of the *furcula*, a globular formation, larger than its head, hard, of a whitish gray colour, and only slightly attached by the cellular tissue. This specimen had a sickly appearance, ruffled feathers, and the point of its beak was a little injured as well as very much grown out of its proper form. A great number of species of this genus (*Timalia*, Horsf. L. Tr. xiii.) are found in the countries around the Indian Sea. They supply on the old continent the place of the American *Myiothera*, to which they have a great resemblance. They are remarkable for their plain gray or brownish colour, large feet, small wings, &c. None of the birds of our climate are so deficient in that gaiety of plumage which distinguishes the feathered tribe; but the tropical countries excel in both splendour and simplicity in great as well as small things. The species of the old continent, which in Temminck's Pl. Col. are called *Myiothera*, belong (most likely all) to *Timalia**.

23. *Cinnyris ceylonica*, Cuv.—*Certhia zeylonica*, Linn. et Auct. ♂ Castaneus ventre flavo, pileo ularumque carpo purpurascens-viridibus, gula uropygioque violaceis, nitidissimis cauda æquali.

Magnit. *Sylvia*, $4\frac{1}{2}$ poll., ala 55 mill., tarsus 17, rostrum 17. Rostrum capite paullo longius, in arcum $\frac{1}{2}$ circuli curvatum.

♂ 7 Febr. Iris fulvescens (subgrisea), colore viridi capitis anterioris carpique minus extensis. Testiculi magnit. pisi, dexter albus, sinister nigro-cinereus, albido reticulatus.

♂ 27 Apr. Iris coccinea, color perfectus, tectricibus alæ parvis omnibus, capillitioque toto viridi-æneis, etiam jugulum violaceum. Testiculi maxime tumidi albi.

♂ 3 Mai. (Junior prioris anni?) Iris obscure rubra. Vertex et gula plumis immixtis cinereis. Uropygium olivaceo-cinereascens, plumis violaceis immixtis. Color metallicus capitis, gulæ alarumque parum extensus. Caudæ alarumque plumæ latius pallescenti marginatæ. Testiculi parvi, fere obsoleti.

I did not succeed in getting a female, although this species was quite common in the neighbourhood of Calcutta. They hopped quickly about between the branches of the trees, like our small *Sylvia*, i. e. *curruca*, *trochilus* and others, which they even resemble in flight. Sometimes I saw them hanging under the branches, like *Regulus*, in order to gather insects out of the buds. It has already been remarked by others, that the food of this bird does not consist entirely of honey, as was supposed from its long, divided and tubular tongue, but they use it to catch insects with. The stomach was always full of little husks, larvae,

* These remarks on the genus *Timalia* are generally correct, although the species above-described is not a *Timalia*, but a *Malacocercus*.—H. E. S.

and other insects, and in the one which I shot in February I found the seed of some plant. This bird, as well as many other small species, however, must be very fond of sweet things, because the Hindoos maintain that they live upon sugar, and the Bengalese name *Sokkor-kurra* signifies sugar-eater. In Madagascar some other kinds of *Cinnyris* are named *Soui-manga*, which it is said means the same. In the month of March, when the large cotton-tree (*Bombax malabaricus*) was in blossom, its tulip-like flowers were very much visited by these as well as some other birds, i. e. the Indian magpie and starling, but they look for insects and not for honey. The stomach is small and very thin, almost like skin; the liver is large and whitish; the tongue is long, divided into two narrow flat strips, and entire, with the margins near the root turned in, almost forming a tube. I only heard a short whistling sound from them occasionally.

24. *Motacilla alba* var., tectricibus alarum majoribus intermediis totis, reliquis pogonio externo albis.—♀ 22 Martii; ala 81 mill., tarsus 20, rectrices mediæ 82. Plaga juguli lunata, verticeque usque in nucham, nigris.

Only one specimen of this species was obtained, but several were seen in the same place near Sucsagor, in the vicinity of the river, also one near Calcutta, February 9. They were all gray above as with us, but in the female brought home, the dorsal feathers have towards their sides and tips a slight though conspicuous streak of black which cannot be seen at a distance in the living specimens. Possibly the older individuals become black in summer, as in many places in southern Europe and central Asia. I saw no more wagtails after the 22nd of March; they probably then migrate to the north. With the exception of the above-mentioned distinctions, the specimen brought home is altogether like the same bird in winter-clothing (March, April) with us, except that the black and white colouring of the head is somewhat purer than is usually the case here with the females. Notes, habits, &c. not thoroughly known.

25. *Motacilla flava*.—Our well-known Yellow Wagtail was seen several times (first on February 9), and was shot once, on March 12, on a grassy plain near the river, where it occurred abundantly along with *Charadrius minor*. As I on that day had collected more birds than I could preserve, the specimen was not brought home; I trusted to shoot a wagtail another time, but did not succeed. As far as I could see, it showed no difference from our common species of South Sweden; and among many which I saw alive at a short distance, I perceived none with a black head, as is common with the adult males in summer plumage in Dalnatia, Lapland and central Asia.

[*Motacilla boarula*?—Several times in February and March there were seen near Calcutta and Serampore, wagtails which could scarcely be other than *M. boarula*; but as I happened to miss them, and had not before seen any living specimen of the species mentioned, I will assert nothing, but merely record what I saw.]

26. *Anthus arboreus* is also one of the commonest birds of Bengal. Two males brought home show no other difference from a Swedish specimen killed near here, than that the dark streak through the eye is somewhat broader, and the spots on the back are somewhat less evident than in Swedish specimens. Their mode of life appeared to me unusual, as I had not before seen them in their winter abodes; they flew about in flocks of five or six together during the month of February, on the ground near bushes and in places overgrown with trees. When alarmed they flew up into the trees. Only seeds were found in the stomach. I do not remember to have seen them after the month of March, but I presume that they then remove to their native abodes in the north. The Bengal name is *Tjorta* or *Tjah*.

27. *Anthus pallescens*, Vig. et Horsf. Linn. Trans. xv. p. 229.—Griseus, fusco-maculatus, subtus albus: pectore antico lineolis crebris oblongis nigro-fuscis; pedibus validis, tarso longit. $\frac{1}{2}$ alæ; ungue postico leviter arcuato, valido, longiore quam digito.

♀ Calcutta initio Maii. Magnitudo corporis fere *A. pratensis*; longit. $5\frac{1}{2}$ poll. Ala 74 mill., cauda 51, tarsus 25. Affinis *A. campestri*, sed pedes majores, caudæ brevior. Supercilia lata, albida, elongata. Linea per oculos et altera ordinaria sub oculis distinctæ, fuscæ. Lineola ordinaria ad latera gulæ tenuis, nigro-maculata. Maculæ pectorales parvæ, longit. 2–3 millim., fasciam pectoralem formant; juguli ventrisque nullæ. Hypochondria fulvescentia. Rectrices utrinque 2 albæ, basi oblique fuscæ; 3^a margine externo tenui albo. Rostrum et pedes albo-pallidi. Iris fuscescens. Rostrum paullo longius, sed non minus validum quam in *A. arboreo*. Color superne griseo-pallescentis, plumis angulatim detritis; superne non rufescens ut in descriptione citata. Alarum fasciæ nullæ.

[Aliud individuum, non conservatum, 23 Martii, differt rectrice 2^a pogonio externo toto fusco; 3^a immaculata.]

This Titlark is only found in open fields, especially on arable land, and never perches on trees. It is consequently not seen near Calcutta, but is common on the more open fields some miles therefrom. The elevated tarsi give them a peculiar, easily recognised aspect, and they are often seen to raise themselves with the body straight up, while the other species of the genus always carry the body horizontal. One may also sometimes see them hop with both feet together, but the most usual action is springing like that of the other birds of the Lark kind. On one occa-

sion I heard one singing some notes, and quavering like a lark, but only for a moment. The food consists of insects, such as *Acheta*, together with rice and other seeds. Both kinds of food were found together in the stomach. In the beginning of May they were seen in pairs; they had previously been solitary. It seems that the same species is also found at Ulimaroa, for I have no doubt that it is identical with the species above quoted.

28. *Alauda* — (*A. arvensis*, Sonn. Voy. ?).—On the great plains about Sucsagor, north from Calcutta, two species of *Alauda* were decidedly seen, which were analogous to *A. arvensis* and *arborea*. One was killed at the first shot, but as I was wearied that evening, and delayed preparing the specimen, I had the misfortune next day to find this, as well as a large portion of my other specimens, destroyed by ants. My intention of shooting another failed, nor did I keep what the ants had left. It was somewhat smaller than *A. arvensis*, had rather stronger markings on the sides of the head, much as in *A. arborea*, and a difference of colour in the tail-feathers. [Rectrice extima alba, 2^a intus oblique fusca, pogonio externo quoque fusco, relicta plaga magna alba trigona.] The song was (in March) not so lively as our lark's, but more tedious and monotonous, such as we sometimes hear it in August. The feathers were worn into an angular form, and the shape of the beak was as in *A. arvensis*. The other species was not obtained.

29. *Alauda gingica*, Lath. no. 14.—Petit Alouette grise de Gingi, Sonn. Voy. *Fringilla cruciger*, Temm. Pl. Col. 269. 1. Duree Finch, Lath. Gen. Hist. vi. 115. Genus *Megalotis*, Swains.

Grisea, gastræi vitta longitudinali, lata, in jugulo cruciata, cum superciliis lorisque nigris. Rostrum crassissimum.

♂ 22 Mart. Iris fusco-rufescens. Rectrix lateralis extus oblique albo-dimidiata. Alarum tectrices inferiores nigræ. Dorsum obsoletissimæ fusco-maculatum. Frons et capitis latera sordide alba. Long. 4½ poll; ala 72 mill., tarsus 17, cauda 40. Lingua apice truncata, setoso-lacera.

This elegant little Lark was seen several times in the open fields. In its flight and motions on the ground it completely resembled a lark, not a *Fringilla*. The specimen described was shot just as it settled on the ground after singing for some moments with expanded wings. Only seeds were found in the stomach. According to Buchanan (in Latham's Gen. Hist.), it lays its eggs in May, and is called *Duree* in Bengal. Of this and some allied species a separate genus, *Megalotis*, Sw., has been made, which from its thick beak has been included among the Finches; but the form of the lower mandible, as well as the mode of life, distinguish it sufficiently therefrom, and it is in order the better to draw attention hereto that I have retained

the generic name *Alauda*. They differ however from the Larks in the thickness of their beaks, the form of the tongue, their unspotted plumage, and the decidedly short and curved hind-toe. Here also belongs *Fringilla otoleucos*, Temm. Pl. Col. 269. 2, but not *F. simplex* and *githaginea* from Africa, which are true *Fringillæ*, Linn. (*Pyrgitæ*, Cuv.).

30. *Fringilla domestica* was found at Calcutta just as in Sweden. On two occasions I had an opportunity to observe sparrows at three to five yards' distance on board ship, and I saw them also in the town, but not in the country, so that I had no opportunity of shooting any. All the males (at least ten or twelve), which I could observe accurately in the manner mentioned, had the head gray above and brown on the sides, as with us. It is remarkable that the hot climate did not make the head of the male brown, as in Italy, Spain and Egypt. Possibly I did not see any old male. *Fringilla montana* was not seen.

31. *Fringilla bengalensis* (non *F. bengalus*, auct.).—*Loxia bengalensis*, Briss., Linn., Lath. no. 36; Edw. 189; Buff. Pl. Enl. 393. 2. (♂ fig. mala). Genus *Ploceus*, Cuv.

Grisea, subtus rufescenti-albida, dorso fusco-maculato; capite superne flavo, lateribus pallide fusco. Rostrum altitudine duplo longius.

Paulo major quam *F. domestica*; rostrum præsertim majus. Ala 74 mill., tarsus 20. Remiges 10; 1^a spuria. Gula albida.

♂ adulta, Mart., Apr., Maio, capillitio toto flavissimo.

♂ jun. (Aprili) fronte ad medium verticem flava.

[♀? Apr. Ovario? ictu læso. Similis ♂ juniore, sed colore paullo sordidior.]

In attitude and habit this bird resembles our common sparrow, and, the yellow crown excepted, its colour is much the same. The species was quite common about Calcutta after April, when they began to build their nests; before April they were not seen. The nests are skilfully suspended under the enormous leaves of the common palm-tree (*Borassus flabelliformis*). The best are of compact coarse hay, and have the appearance of a purse; they are 13 or 14 inches long, 7 inches broad in the lower part, growing smaller upwards to the breadth of 2 inches, and externally smooth; but they are in great part solid, so that only the lowest extremity has a small spherical cavity of 5 inches diameter, with a pendent cylindrical entrance at the side. The nest is built from above, so that the cavity is made the last. When it is half-made, so that the bottom is wanting, a transverse wall is made, and the structure has consequently two holes in the lower part, one for the nest, the other for the entrance. These are afterwards completed, each by themselves. The males were supposed to be chiefly occupied in collecting materials, and this

seemed the most probable. Although I shot many in order to procure a female, I only succeeded in getting the one above-noticed, which however I cannot with certainty pronounce to be one. It was shot down from a half-finished nest at more than twenty yards high. Two or three nests are often attached to the same leaf, and twenty or thirty in the same palm. In the beginning of May the newly-hatched young were obtained from a nest, and three quite white eggs from another, although many nests were scarcely half-built.

The notes near the nests were like the warbling and call-notes of the linnet. No song was heard. In the stomach only rice-grains were found, which they were seen to pluck while hopping about the cottages, like sparrows with us. The Bengalese name is *Bawee* (the *w* sounded as in English).

[To be continued.]

XXVIII.—On the Growth of Cell-Membrane.

By HUGO V. MOHL*.

[Continued from p. 155.]

WHEN we compare the conclusions necessarily resulting from these calculations with Harting's theory, we see that they are decidedly opposed to it. We have good grounds for the assumption that the mean number, derived from the measurement of ten rows of cells, indicates with tolerable accuracy the course of the normal development of the wood-cells of *Hoya carnososa*, since the mean numbers already derived from the measurement of five rows of cells differ but very slightly from those above mentioned. If we assume this, it follows that the nearer the intermediate (*mittlere*) wood-cell (if I may so express myself) of this plant approaches the margin of the wood in consequence of the progressive conversion of the inner cambium-cells into wood-cells, the more it enlarges in the radial direction, so that its diameter is $\frac{1}{10\frac{1}{2}}$ of a millimetre when it lies in the second row of cambium-cells (counted from the wood), and when it has advanced to the inner row, bordering the wood, the diameter is increased to $\frac{1}{9\frac{1}{2}}$ of a millimetre. According to Harting's view, the cavity of the cell will continue of this size†, since in his opinion the con-

* From the 'Botanische Zeitung,' May 29th and June 5th, 1846. Translated by Arthur Hensfrey, F.L.S. &c.

† I here take the diameter of the cavity of the cell as equalling the diameter of the whole cell, which is not altogether right, but deviates little from the truth, since the cambium-cells of *Hoya carnososa* have very thin walls, and as these walls are double, only half this thickness shou'd be reckoned. This is so small a size and one so difficult to give accurately that I thought it might be disregarded; in a measurement which however cannot claim strict ac-

version of the cambium-cell into a wood-cell depends on the deposition of secondary layers upon the outside of the cell; or rather, as was shown above, the cavity of the cell must enlarge in the radial direction in consequence of this external addition of secondary membranes. If we compare with this the size of our intermediate wood-cell, the hypothesis cannot be brought into agreement with its dimensions, for the cavity of the cell lying in the outermost circle of wood diminishes from $\frac{1}{8}$ to $\frac{1}{14}$ of a millimetre, while the total diameter of the cell increases to $\frac{1}{3}$. These calculations prove beyond a doubt, that in the conversion of a cambium-cell into a wood-cell the cavity is far from remaining of the same size or enlarging; on the contrary, it becomes very manifestly smaller: this can only be accounted for by a deposition of secondary layers on the inside of the primary membrane, or by the assumption of the occurrence of an external compression of the cell-membrane on every side, causing it to occupy a smaller space, for which process no analogy is to be found throughout all vegetable anatomy. That the total diameter of the cell distinctly increases (from $\frac{1}{8}$ to $\frac{1}{3}$ millim.), while at the same time the cavity becomes smaller, is not in the least an objection to the hypothesis that a deposition of secondary layers takes place in the interior of the cell, because there is no reason to prevent our assuming that an elementary organ may increase in breadth, by the intus-susception of new organic matter between the molecules of which its membranes consist, during the deposition of secondary membranes. That such a growth is possible and actually does take place, convincing proof is offered by the spiral vessels situated in the interior of the vascular bundle, the spiral fibre of which every one certainly considers as a secondary deposit. This enlargement of the whole cell does not yet attain its maximum while it lies in the most external row of the wood-cells; the above measurements show that in the wood-cells of the second circle the total diameter had increased from $\frac{1}{3}$ to $\frac{1}{1}$, the cavity from $\frac{1}{14}$ to $\frac{1}{10}$ of a millimetre. As seen by these numbers, the total diameter of the cell has increased in a greater proportion than the diameter of the cavity, whence the inference, that simultaneously with the enlargement of the cell, a thickening of its walls takes place, which however is not quite sufficient to hinder the enlargement of the cavity of the cell, by the expansion of the cell-wall.

If from this refutation of the reasons adduced by Harting in favour of the external addition of the secondary layers, founded on micrometrical measurements, we pass to an anatomical accuracy, the thickness of the walls parallel with the wood of the cambium-cells of *Hoya* amounted to at all events not more than $\frac{1}{100}$ of a millimetre, if anything less.

mination of the wood-cells themselves, their structure affords decided proof, that secondary layers are deposited upon the inside of the primary membrane. The analogy between the structure of the wood-cells and that of parenchymatous cells, as for instance the cells of horny albumen, the dotted, thick-walled medulla- and bark-cells of *Hoya carnosa*, in which Harting himself does not deny an internal growth, at once offer reasons not to be disregarded, for the assumption of an analogous process of development in the two kinds of cells. Where the anatomical relations of the individual layers are so perfectly analogous, it would require very clearly-ascertained facts to induce us to assume that nature follows a different law of formation in the wood-cells from that which obtains in the parenchymatous cells, and of such facts I have no knowledge. On the other hand, the history of the development of prosenchymatous cells affords in my opinion very certain evidence of the contrary. In relation to this perhaps there is nothing so instructive as the examination of the cells of the *Coniferae*, and I believe that a conclusion deduced from these elementary organs will hold good in reference to the wood-cells of Dicotyledons, since spiral fibres on the inner surface of the cell, together with a bordered dot, resembling those occurring in *Taxus*, are also found in many wood-cells, as for instance in *Viburnum Lantana*. Now the examination of young shoots of *Pinus sylvestris* (and exactly in a similar manner also, the examination of young dotted vessels of dicotyledonous wood) affords evidence that the cavity which subsequently forms the border of the dot, and which is situated between the outer closed membranes of two contiguous cells, appears very early, while the cell-membrane is yet very thin, and is in every case already perfectly formed at a period when no trace can be seen of the dot, leading to the cavity, situated in the inner layer of the cell. It does not admit of the slightest doubt therefore, that the outer closed membrane of the cell is the primary, and that the inner layers which are perforated by the canals of the dots are subsequently deposited upon the inner surface of the primary membrane.

It is not here meant to be denied that deposits do occur upon the outer side of the primary membrane in many cases, for instance in this very wood of *Pinus sylvestris*. This takes place in the intercellular passages which are found between the cells while their walls are still thin, in which an intercellular substance is deposited; but this has nothing to do with the thickening or growth of the cell-membrane.

Although in the foregoing remarks, I have been forced, in the defence of my theory, to repel many of the objections advanced by Harting and Mulder on anatomical grounds, because I cannot

acknowledge as accurate the observations upon which they are founded, it is otherwise with the objections which those observers have brought forward in a chemical point of view, since I do not indeed differ from them as to the facts they mention, but cannot agree with the conclusions they have thence drawn.

Although Harting and Mulder are not themselves always of the same opinion in reference to the chemical constitution of the compounds found in the cell-wall, yet in regard to the history of development of the cell-wall they draw similar conclusions from their joint investigations, so that I can here take their objections together. The most important points coming under consideration are the following:—

The wall of young cells consists in general of cellulose alone, it being coloured blue by iodine and sulphuric acid; in older cells on the contrary, which possess thickened walls, distinct layers may usually be distinguished, differing chemically. In the wood-cells, bark-cells and milk-vessels, the outermost layer (*external wood-membrane* of Mulder; *cuticle of the wood-cell* of Harting) consists of a substance wholly insoluble in sulphuric acid. That this membrane is produced after that which is composed of cellulose, is evident from the circumstance that the young wood-cells acquire the blue colour in every part; the outer membrane is therefore considered by Harting and Mulder as a layer deposited on the outside of the membrane composed of cellulose. From the relation of this outer membrane to the first-formed pores, Harting derives the variations of the canals of the dots: when the outer membrane is produced in proportionately more abundant quantity and spreads itself between two cells, over their whole surface, the pores become closed; if, on the contrary, this membrane be only deposited in the same proportion as the cells increase in breadth, the pores remain open; if, lastly, its development do not keep pace with the expansion of the cell, a cavity is produced between the dots. From the circumstance that in the full-grown cell the layer of cell-membrane surrounded by this outer membrane is usually no longer coloured blue by iodine and sulphuric acid, but this colour, even when it appears at all, is only to be found in the inmost layer bordering the cavity of the cell, while the remaining portion is coloured either yellow or green, it is further deduced, that these intermediate layers of the cell (Mulder's *intermediate ligneous substance*), which take a yellow colour with the reagents mentioned and are soluble in stronger sulphuric acid, have been deposited, at the same time as the outermost layer, in the direction from within outwards. Mulder's and Harting's views however do not wholly agree in reference to the formation of this layer. The former assumes, that either the cellulose is wholly absorbed and becomes replaced

by this intermediate ligneous substance, or that the intermediate ligneous substance is deposited on the outside of the oldest and innermost layer (the cellulose); while Harting assumes that this encrusting matter does not replace the cellulose, but permeates the cell-wall composed of cellulose from within outwards and accumulates in preference in its outer layers. This intermediate ligneous substance is always combined with proteine. As analogous to this deposition of intermediate ligneous substance, as the intermediate layers of wood- and bark-cells and as the outer layer of medulla-cells (in which latter Mulder did not find the outer ligneous layer), other encrusting matters occur in the cells of particular organs, for instance pectose in the so-called *Collenchyma*, and in the milk-vessels a substance partly isomeric with vegetable mucilage, partly with cellulose, in the cells of the horny albumen of *Alstrœmeria*, *Iris*, *Phytelephas*, &c.

The conclusion which Harting and Mulder draw from the chemical facts here mentioned, with regard to the development of cell-membrane, goes to establish the opinion, that those layers, which in the membrane of a full-grown cell are characterized by a peculiar chemical reaction, not yet presented by the membrane of young cells, have been formed subsequently to the membrane, consisting of cellulose, of the young cell, and that since these layers occur on the outside of the full-grown cell (the innermost layer of which is composed of cellulose, and therefore corresponds to the membrane of the young cell), the cell-membrane has increased in thickness in consequence of the subsequent deposition of layers, differing chemically, from within outwards.

Let us examine whether these conclusions be not too hasty. It does not admit of the slightest doubt, that the chemical compounds which are coloured yellow by iodine and sulphuric acid, and which characterize the outer and intermediate layers of most full-grown cells, are of later origin than the cellulose which forms the membrane of the young cell. From this fact however it is a great leap to the assumption, that these layers, which are composed of a substance differing from cellulose, are in reference to their situation also newly-formed layers, which are wanting in young cells. This is quite possible; but it is also possible, that the fact as shown by anatomy is altogether otherwise. If we first of all disregard totally the above distinct anatomical facts, we may, with quite equal right to that by which an external formation of a new layer is inferred, guess, that in a layer of the cell originally consisting of true cellulose, subsequently, and without any alteration of its relations of position, the cellulose is absorbed and replaced by an essentially different chemical compound; or that the cellulose remains and a new compound is deposited between its molecules, and prevents more or

less completely the reaction of cellulose, which this in its normal condition exhibits towards iodine and sulphuric acid. Such an infiltration might perhaps occur without visible thickening of the layer, either if it were not in very great abundance, or if the growth of the membrane in a lateral direction connected with development of the cell were to afford space for the deposit of a considerable quantity of a foreign compound. In these cases, the possibility of which in the first place certainly no one will call in question, a layer would indeed be formed altogether new in a chemical aspect, but no alteration in anatomical relations would appear; and from this subsequently-resulting chemical transformation no conclusion should be drawn as to the order in which the different layers of the cell-membrane originate, since these metamorphoses may take place quite as readily in the last as in the first formed layer*. If we admit the possibility of such a metamorphosis in particular layers, it must also be admitted that the chemical reaction of a certain layer affords no sure means by which it may be recognised as a peculiar anatomical layer, since it may easily be imagined, that in different cells, the layers corresponding to each other in an anatomical point of view may exhibit a great distinction in regard to their chemical transformations. Until well-grounded experience has taught us which of the cases, which have here been mentioned as possible, really occurs in nature, we can only allow ourselves to be guided in the recognition of the different layers and the determination of the order in which they make their appearance by their anatomical relations; and although in very many cases the influence of chemical reagents affords an excellent means by which we are enabled to distinguish the individual layers of cell-membrane, which without this assistance it would be difficult or impossible to recognise, yet in availing ourselves of this assistance we must keep the anatomical relations constantly in view.

The consideration of these relations leads one, I believe, to a result diametrically opposed to that maintained by Mulder and Harting.

In the next place will come conveniently the question, whether the outer wood-membrane is produced out of a cellulose membrane, or is deposited on the outside of an already formed cell. This membrane exhibits the most striking contrast to the membrane composed of cellulose; if it can be proved to owe its origin to the transformation of a cellulose membrane, the much slighter

* This is no mere guess, as in the parenchyma-cells of some Fern stems, especially of *Polypodium incanum*, *P. nitidum*, the inmost layer of the cell, an analogue of their primary membrane, is far richer in a substance coloured yellow by iodine than the intermediate layer, and requires a much stronger action of sulphuric acid for the production of a blue colour.

differences which distinguish the secondary cell-membranes from true cellulose will appear to us of less consequence. This proof however, in my opinion, the outer wood-membrane furnishes the most clearly of all. I have already, reasoning on the examination of the wood of *Pinus sylvestris*, on anatomical grounds, shown the outer membrane to be the primary; chemical examination of young cells does not contradict this, since at the time when the borders of the dots are already perfectly formed, but neither the dots themselves nor the inner layers in which they are situated yet exist, the membrane of these cells is coloured by iodine and sulphuric acid, not yellow, but blue. The relation of the membrane to the borders of the dots leaves no doubt that we have here to do with the same membrane which subsequently appears as the outer layer of wood with wholly altered chemical properties. We must therefore assume, that the cellulose of which this membrane originally consists is either absorbed and replaced by the substance of the outer ligneous layer, or that the latter penetrates into the cellulose and prevents its reaction towards iodine and sulphuric acid. Which of these cases occurs, cannot be decided until some solvent for the substance of this membrane shall be found which will not at the same time dissolve the cellulose, yet remaining in it, or at least will give some evidence of its presence. Since such a solvent is not yet known, the question must for the present remain open; perhaps the following observations may afford a hint.

I tried next whether the action of stronger sulphuric acid on the outermost layer of membrane of the wood-cell, especially in the *Coniferae*, would produce a blue colour, but did not in this way attain my object. The formation of the blue colour depends therefore on the simultaneous reaction of sulphuric acid, iodine, water and cellulose. If concentrated sulphuric acid be applied, the cell-membranes do not become blue so long as the necessary water is wanting; or if they be already coloured blue, this colour is soon lost again, and the secondary layers become dissolved. This solution however affords no convenient means by which to obtain the outer membrane isolated, and to examine the colour which, after the action of a stronger acid, it assumes with iodine and weak acid, since so soon as water and tincture of iodine are added to the fluid in which the preparation lies, the dissolved cellulose is precipitated again of a very dark blue colour, and envelopes the outer membranes in such a manner, that no certain conclusions can be drawn as to its colour. I sought therefore to separate the outer membrane from the secondary layers before I applied the sulphuric acid to it. This may always be done in the fibres of the liber of the black fibrous wood of the Palm which is imported from Brazil for the manufacture of sticks,

&c., as the liber-cells may easily be detached from each other if the vascular bundles have been kept for some time in dilute nitric acid, by which means the outer membranes of the contiguous cells are not separated from each other, but from the secondary membranes, and may be obtained isolated in large pieces. With iodine and sulphuric acid of a degree of concentration which does not dissolve the secondary membranes, but colours them bright blue, this outer membrane behaves exactly like the outer membrane of the wood-cells of dicotyledons, that is, it does not swell up, but acquires a dark yellow colour. If we apply stronger sulphuric acid, capable of completely dissolving the secondary layers, the outer membrane, without any perceptible expansion, acquires either an intense greenish or tolerably pure blue colour. This contains cellulose also, but in what I may call a much more strongly combined condition than is the case in the secondary layers, so that not only is a far stronger acid necessary to bring out the blue colour, but the cellulose present in this membrane is also protected from solution. This greater resistance to the action of sulphuric acid clearly can only depend upon the presence of the substance which acquires the yellow colour with iodine and sulphuric acid. This resistance however has a certain limit, since this membrane is soluble in more concentrated sulphuric acid. It differs therefore in reference to this last circumstance from the outer membrane of the wood-cells of dicotyledons, which resists the action even of the more concentrated sulphuric acid. To try therefore whether cellulose might not be discovered in the latter by the action of a stronger acid, I submitted the wood-cells of various *Coniferae*, particularly of *Pinus sylvestris*, to a similar treatment with nitric acid, &c. The experiment succeeded but imperfectly. After the action of a strong acid, the outer membrane exhibited throughout a greenish colour, but the development of the blue colour was so weak, that I remained in doubt whether it was actually situated in the outer membrane itself, or whether possibly it was not to be ascribed to a thin layer of adhering cellulose. I place no weight therefore on this experiment, and mention it here chiefly to invite others to direct their attention also to this point.

The following observations made on Ferns appear to me to bear more importantly upon the theory of the development of cell-membrane:—The brown cells which in Ferns form the layer by which the vascular bundles are surrounded, withstand the action of sulphuric acid as obstinately as perhaps any other vegetable tissue. In many Ferns all the walls of these cells do not possess a brown colour, but merely those portions of the walls lying upon the vascular bundle, or these and the side walls, while the side turned away from the vascular bundle is unco-

loured, and reacts like cellulose with iodine and sulphuric acid. The brown-coloured walls are usually much thicker than those consisting of cellulose. Leaving the brown colour out of view, these cells correspond exactly, in respect to form and their behaviour toward iodine and sulphuric acid, with the epidermis-cells of many leaves. Similar cells occur in the parenchyma of the stem of *Polypodium nitidum*, Kaulf, some isolated, some in groups of three or four, scattered among the parenchyma-cells, which are usually composed of cellulose; in these cells also one wall is generally thinner and formed of cellulose, while the remaining walls are very thick and brown, and withstand sulphuric acid. All sides of these cells are finely dotted, as is also the case in the cells of the brown coat inclosing the vascular bundle; the dots penetrate as well in the thickened brown as in the thin walls, from within outward to the thin outer and imperforate membrane, which membrane possesses the same chemical peculiarities as the secondary layers lying behind it; that is to say, it consists sometimes of cellulose, at others of a substance withstanding sulphuric acid. Now I found, both among the cells scattered in the parenchyma and in the brown layer inclosing the vascular bundle, particular cells, which certainly, in reference to their form, though not in regard to their chemical characters, wholly agreed with neighbouring brown cells, in which therefore one wall was also thin and the rest considerably thickened. In some parts all the walls of these cells, both thick and thin, consisted of cellulose; in other parts the thickened walls were only composed of the brown substance in one point, while the remaining portion, transversely through the whole thickness of the cell-wall, consisted of cellulose; the line of demarcation between the brown and the uncoloured portions was not distinctly defined. From the piecemeal composition of the cell-walls of tracts formed of cellulose, and others consisting of brown substance, it clearly results that the greater thickness which the brown walls of these cells usually possess, compared with the walls consisting of cellulose, is neither to be ascribed to the deposition of membranes upon the outside of the young cellulose membrane, nor to the interposition of a considerable mass of brown substance between the molecules of the cellulose, since if the formation of the thickened brown walls depended on these causes, the portions consisting of cellulose could not have exhibited the same thickness and form as the coloured portions in the only partially brown-coloured cell-walls. The reason of the brown colour therefore, and of the altered chemical behaviour, must be looked for in a transformation of the whole substance leaving the form and organization of the cell-wall unchanged, or in the infiltration of a

foreign matter in a quantity very small in proportion to the cellulose.

I thought it necessary to enter more minutely into the description of these cells, because they offer the clearest evidence that the presence of a compound differing chemically from cellulose in a thickened cell-wall, even when traces of cellulose can no longer be detected in the membrane by iodine and sulphuric acid, affords no sufficient ground for the assumption that the thickening of the wall depends on the deposition of an incrusting substance, and that we have to regard those portions of the cell-wall formed of this substance as produced subsequently to the portions which are composed of cellulose. Were the incrusting substance, situated at particular points, to penetrate through the whole cell-wall (primary and secondary membrane) in these cells, the extent to which it spread would include the outer layer of the cells, so that this layer would possess all the peculiarities of the outer wood-membrane, and it would thus exactly fit all the conclusions respecting this membrane which Mulder and Harting have drawn; on the other hand, it is not necessary to indicate more minutely how false would be the assumption of its originating subsequently.

The organization of the above-described cells of *Polypodium nitidum* appears to me to be of importance in so far as it is capable of warranting our conclusions as to the structure of epidermis-cells and cuticle, which corresponds with it exactly in an anatomical point of view. Some years since* I stated the anatomical grounds which prevented my regarding the cuticle as a layer secreted upon the outside of the epidermis-cells, and which testified that it consists of the thickened outer walls, and partly also of the side walls of the epidermis-cells, the substance of which has become capable of resisting sulphuric acid in consequence of a peculiar metamorphosis. This explanation does not appear to have met with a favourable reception, but renewed researches have caused me to persevere in my view, and it appears to me to be especially proved by such cases as where the cuticle of canals or dots is continued out from the cavity of the epidermis-cell (as in the leaves of *Hakea gibbosa*), or where the side walls of the epidermis-cells are dotted and possess the same chemical peculiarities as the cuticle (e. g. in *Hakea gibbosa*, *H. pachyphylla*, *Hoya carnosa*), where also undoubted primary and secondary membranes in a similar manner exhibit the chemical characters of the outer wood-membrane; lastly, such cases as where the primary membrane of the side wall in that half which is directed toward the upper surface of the leaf

* *Linnæa*, t. 16. Verm. Schriften, 260.

possesses the chemical peculiarities of cuticle, and that half, on the other hand, which is contiguous to the parenchyma of the leaf, the characters of cellulose (e.g. in *Hoya carnea*, *Aloe obliqua*, *margaritifera*). In all these cases cells present themselves to us, the walls of which, either in certain situations or throughout their whole extent, withstand sulphuric acid, and in which no cellulose is to be discovered. The analogy which exists between these cells and the above-described cells of *Polypodium nitidum* appears to me to be of importance to the explanation of these latter circumstances. If it be certain in these last, that their membranes, notwithstanding that no cellulose is any longer to be demonstrated in them, nevertheless have their origin from a cellulose layer which exhibits exactly the same organization and thickness as the incrusting membrane, and in many cases still forms particular parts of the membrane, not even then must the conclusion be drawn in respect to the cuticle from its chemical constitution, that it is a layer secreted upon the upper surface of the epidermis-cells, until it can be demonstrated that this theory is in accordance with the anatomical phenomena, and that the instances I have given of a composition of cuticle from cell-membranes, and of the occurrence of epidermis-cells with side walls, partly consisting of cellulose and partly of the substance of cuticle, are founded upon false observations.

Whether now in these cases the cellulose is partly or wholly absorbed and replaced by the incrusting matter, or whether its reaction to iodine and sulphuric acid is merely prevented by the latter, is uncertain. It appears however to me not improbable that the latter is the true view, since the assumption that incrusting substance coloured yellow by iodine and sulphuric acid at least to a certain degree interferes with the known reaction of cellulose, supported not only by the above-mentioned behaviour of the outer layer of the liber fibres of a Palm and of the wood-cells of *Pinus sylvestris*, but also by the behaviour of the secondary layers in almost all full-grown wood- and parenchyma-cells. Young cells, for instance the pith of a young shoot of *Sambucus nigra*, the cambium-cells of dicotyledons, &c., become coloured bright blue by the application of a very dilute acid, while the medulla-cells of a full-grown branch of *Sambucus* and the perfect wood-cells, treated with the same acid, only develop a yellow colour and require it much more concentrated, and then as deep a blue colour is not produced, on account of the yellow colour of the incrusting matter mixing with and rendering it green. A bright and intense blue colour can usually only be obtained in the secondary layers of full-grown wood-cells when so strong an acid is employed that they do not merely swell up but are par-

tially dissolved; in this case the dissolved portion is precipitated in combination with iodine, if the acid be diluted with water, of a splendid and intense blue colour, while the portion of the membrane, the organic structure of which has not been destroyed, although it has undergone a considerable breaking up, exhibits the blue colour but weakly in proportion, and frequently appears green on account of the preponderating intensity of the yellow colour. Since in this manner a perfect destruction of the organization of the secondary incrusting layers renders it possible for the reaction of cellulose toward iodine and sulphuric acid to manifest itself, it is certainly conceivable that in cases where the sulphuric acid is not in a condition to affect a membrane, cellulose may be present in it, but be protected from the action of the acid by the incrusting matter, and thus rendered imperceptible.

BIBLIOGRAPHICAL NOTICES.

Palæontographica: Beiträge zur Naturgeschichte der Vorwelt. Herausgegeben von Dr. W. DUNKER und HERM. VON MEYER. 1 Band, 1 Lieferung.—*Palæontographica: Contributions to the Natural History of the Antediluvian Era.* Edited by Dr. WILLIAM DUNKER and HERMANN VON MEYER. Vol. i. part 1. 4to. 44 pp. and six plates.

Under this title the editors intend giving full descriptions of remarkable fossils hitherto unpublished, illustrated by accurate and highly finished plates. The first part contains: 1. A description of a new species of *Pterodactylus*, *Pt. Gemmingii*, by Hermann von Meyer, followed by a synoptical table of all the sixteen species hitherto known of that highly interesting genus of flying Saurians. 2. A description of *Aspidura Ludenii*, by Friedrich von Hagenow,—a very curious species of *Ophiuridæ* found in the "Muschelkalk" near Jena. 3. A description of a superb palate of *Myliobatis Testæ*, new species, from Sicily; of *Tornatella abbreviata*, new species from the Gosau formation; and two teeth of *Squalidæ*, found near Cassel. 4. A description of *Omphalomela scabra*, a fossil trunk of a plant found in the limestone banks of the Keuper formation near Kölleda in Thuringia, by Professor Germar. 5. Description of several new plants from the copper-slate formation of Richelsdorf, by J. Althaus, with a synopsis of all the plants hitherto met with in that formation. 6. Descriptions of several new species of shells, partly marine, partly fluviatile, recently discovered near Halberstadt in a sandstone belonging to the lias formation, and highly remarkable from their perfect preservation, which allows in many cases of their colours being recognised. 7. Enumeration of the fossil shells occurring in the tertiary formation of Magdeburg, by Dr. Philipp.

Symbolæ ad Historiam Heliceorum; auctore L. PFEIFFER. Sect. prima 1841, altera 1842, tertia 1846.

In the two former parts of this work the author has given an account of his views on the systematical distribution of the great family of *Helicea*, the synonymy of all the genera and species known to him at that time, and descriptions of 280 species, most of which were new, and the remaining ones incompletely described, or only known by figures and names. The third part contains: 1. An account of the method of distributing the immense number of species of *Helix* (including *Nanina* and *Stenopus*) by a system merely artificial, but suitable, in the author's opinion, for assigning to every species the place where it may be sought, without comparing the total number of nearly 1100 species.

2. A systematical enumeration of all known living *Helices*, in which the author has marked the species (about 630) which he possesses in his collection, those which he has studied in other collections, and of which he has made accurate descriptions for his 'Monograph,' and those which he knows only from descriptions or figures. Under every species is quoted the work where it is first published, or some good figure.

3. An alphabetical enumeration of all fossil *Helices*.

4. Additions to the synonymy of all the genera of *Helicea*, containing many corrections of names, in accordance with the law of priority.

5. Descriptions of 145 species (*Helix*, 77; *Helicophanta*, 1; *Vittrina*, 3; *Tomogeres* (*Anostoma*), 1; *Bulimus*, 31; *Achatinella*, 3; *Achatina*, 13; *Pupa*, 1; *Clausilia*, 15 species).

6. A continued enumeration of the works which are quoted in the three parts of the 'Symbolæ.'

PHILIPPI's *Figures and Descriptions of new or incompletely known Shells*. Vol. i. 1842-45; vol. ii. No. 9-11, 1845-46.

This work, which contains contributions by Anton, V. D. Busch, Dunker, Jonas, Koch, Pfeiffer and Troschel, is destined to give, like Guérin's 'Magazin,' figures of new and interesting shells, with descriptions and critical remarks. The figures are drawn on stone and coloured.

The first volume contains, on 48 plates, figures of 4 species of *Arca*, 5 *Artemis*, 22 *Bulimus*, 4 *Cyclostoma*, 19 *Cylindrella*, 10 *Cytherea*, 12 *Fusus*, 13 *Glandina* and *Achatina*, 6 *Haliotis*, 50 *Helix*, 4 *Mactra*, 40 *Melania*, 2 *Murex*, 12 *Natica*, 11 *Nerita*, 15 *Neritina*, 15 *Paludina*, 11 *Pecten*, 8 *Psammobia*, 4 *Pyrula*, 9 *Sigaretus*, 6 *Solen*, 2 *Steganotoma*, 1 *Streptaxis*, 1 *Strombus*, 12 *Tellina*, 43 *Trochus* (*Turbo* and *Monodonta*), 4 *Unio*, 16 *Venus*.

The three parts of the second volume, which are already published, contain figures of 6 species of *Arca*, 10 *Astarte*, 7 *Bulimus*, 16 *Cylindrella*, 9 *Cyrena*, 8 *Fissurella*, 6 *Fusus*, 3 *Haliotis*, 25 *Helix*, 3 *Mactra*, 13 *Natica*, 1 *Ostrea*, 2 *Streptaxis*, 10 *Tellina*, 18 *Trochus*, 5 *Venus*.

Journal of Malacozoology, edited by K. TH. MENKE. Vols. i. and ii. 1844-45, Hanover. Vol. iii. edited by MENKE and PFEIFFER, Jan. -June 1846.

The 'Zeitschrift für Malakozoologie' has been founded by Dr. Menke for publishing original treatises on single families, genera or species of living or fossil shells, descriptions of new species, notices respecting the geographical distribution of mollusca, critical analyses of new malacological works, biographical and necrological notices, &c.

The third volume begins (Jan. 1846) with a review of the geographical distribution of the family of *Helicea*, continued in the numbers for May and June, by Dr. Pfeiffer.—Dr. Jonas publishes his views on the genus *Proserpina*, Guild., to which he refers his *Helicina linguifera*, and descriptions of some new land-shells from Guinea, and marine shells from Singapore and the Red Sea.—Dr. Philippi describes new species of *Corbula*, *Tellina*, *Diplodonta*, *Luccina*, *Patella*, *Acmaea*, *Siphonaria*, *Trochus*, *Buccinum*, *Terebra*, *Colymbella* and *Dentalium*, most of which are from Mazatlan.—Dr. Dunker continues his descriptions of shells collected by Dr. Tams on the west coast of Africa, from Benguela and Zouanda.—Dr. Pfeiffer gives a critical review of the genus *Cyclostoma*, enumerating the species figured in Sowerby's 'Thesaurus,' with remarks on the frequent priority of the names published by Grateloup, Anton, Jay, Lea, &c. He describes as hitherto unpublished species: *C. stenomphalum*, P., *Ottonis*, P., *limbiferum*, Mke, *Largillierti*, P., *costatum*, Mke, *Gruneri*, P., *plicatulum*, P., *alutaceum*, Mke, *dubium*, P., *hieroglyphicum* (Hel.), Fér. Some other species, *C. lima*, *Bronni*, *Binneyanum*, Adams, were already described in the 'Proceedings of the Boston Society, 1845,' and *C. strangulatum*, probably by Benson.—Dr. Jonas has examined some species figured in the 'Description de l'Egypte,' and describes them together with some other new shells from the same locality.—Dr. Menke gives some short necrological notices.

Indicis Generum Malacozeorum Primordia. By A. N. HERMANNSEN. Fasc. I. 1846.

Since the date of the Linnæan nomenclature, an immense number of creatures formerly unknown have been discovered; and, consequently, the quantity of names and systematical designations in every part of natural science has increased in an almost overwhelming manner. Comparatively few authors have regarded the justice due to those who have preceded them in their labours; many of them have imposed and changed names, without knowing whether the objects were already named and described or not. From this and other causes there exists in every branch of zoology such a quantity of synonyms of genera and families, that with regard to some genera it is nearly impossible to ascertain which name was first used, and in what sense it was employed by different writers. For this purpose our author has elaborated an alphabetical index of all systematical names occurring

in Malacozoology, together with the indication of the writer who gave them, and the time at which he did so, the work in which each was first described, the various senses in which the same name is used by various writers, and the synonyms or names designating the same object in the works of other writers; in short, an historical account of every genus, containing all notices of importance with regard to it. It is impossible, as the author himself declares, that a first essay of this sort should be absolutely complete; but from the whole of the works which he was able to peruse, and these include all the more important ones for his purpose, the above particulars are extracted with the utmost accuracy, and all names and corrections which may subsequently come to the author's knowledge are to be published in a supplement at the end of the work.

The first part of the 'Primordia' has just been published, in which, after a short preface, the author has thought it necessary to direct the reader's attention to those excellent laws of nomenclature proposed by Linnæus in his 'Philosophia Botanica,' adapted and illustrated according to their use in Malacozoology (pages vii.-xiv.). Then follow the complete titles of 170 works, perused and quoted by the author, in chronological order; and the remaining sheets of this part contain the letter A. of the alphabetical index itself.

The index comprises all names of classes, orders, tribes, families, genera and subgenera of living and fossil Mollusca, excluding the *Cirripeda*, *Tunicata* and *Rhizopoda*, which do not belong to the Mollusca, although still referred to this class by some naturalists.

Figures of Flowering Cactææ, edited by PFEIFFER and OTTO; with German and French descriptions. Vol. i. 1843; Vol. ii. Nos. 31 & 32, 1846.

This work gives coloured figures of flowering *Cactææ*, the greater part of which had not yet been figured. The first volume contains in six parts (from 1838-1843) natural-sized figures of *Mammillaria bicolor*, *cirrhiifera*, *Seitziana*, *uberiformis*, *uncinata*, *eriacantha* and *pyncacantha*; *Echinocactus Sellowianus*, *centeterius*, *phyllacanthus*, *leucacanthus*, *acutissimus* and *hybocentrus*; *Echinopsis multiplex*; *Cereus flagriformis*, *Curtisii*, *coccineus*, *setaceus*, *eriophorus*, *undatus*, *Schrankii*; *Phyllocactus Hookeri*, *Phyllanthus* and *latifrons*; *Epiphyllum Altensteinii*; *Rhipsalis platycarpa* and *pentaptera*; *Opuntia Salmiana*, *curassavica*, *foliosa*, *coccinellifera*, *brasiliensis*, and *Pereskia Bleo*.—Vol. ii. No. 1: *Discocactus insignis*; *Echinocactus Pfeifferi*, *turbiniiformis*; *Echinopsis oxygona*; *Cereus peruvianus*.—Vol. ii. No. 2: *Echinocactus tetracanthus*; *Echinopsis turbinata* and *pectinata*; *Mammillaria sephyranthoides*, and *Pfeiffera coreiformis*, a new genus of *Rhipsalideæ* described by the Prince of Salm-Dyck.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

July 14, 1846.—Wm. Yarrell, Esq., Vice-President, in the Chair.

Prof. Owen communicated, as an 'Appendix to his Memoir on the Dinornis,' some observations on the skull and on the osteology of the foot of the Dodo (*Didus ineptus*).

After a brief summary of the history of this remarkable extinct brevipennate Bird, in which the reduced highly finished figure by Savery, in his famous painting of 'Orpheus charming the Beasts,' now in the collection at the Hague, was particularly noticed; and the recent discovery of the skull of the Dodo amongst some old specimens in the Museum of Natural History at Copenhagen was mentioned, he proceeded to demonstrate the peculiarities of the Dodo's skull, by a comparison of the cast of the head of the bird in the Ashmolean Museum at Oxford with those of other recent and extinct species of Birds.

The Dodo's skull differs from that of any species of *Vulturidæ*, or any Raptorial Bird, in the greater elevation of the frontal bones above the cerebral hemispheres, and in the sudden sinking of the inter-orbital and nasal region of the forehead; in the rapid compression of the beak anterior to the orbits; in the elongation of the compressed mandibles, and in the depth and direction of the sloping symphysis of the lower jaw. The eyes of the Dodo are very small compared with those of the *Vulturidæ* or other *Raptores*. The nostrils, it is true, pierce the cere, but are more advanced in position; this however seems essentially to depend upon the excessive elongation of the basal part of the upper mandible before the commencement of the uncinated extremity; the nostrils are pierced near the commencement of this uncinated part as in the *Vulturidæ*, but are nearer the lower border of the mandible in the Dodo.

The resemblance between the skull of the Dodo and that of the Albatros is chiefly in the compression and prolongation of the curved mandibles: there are no traces in the Dodo of the hexagonal space on the upper surface of the cranium of the Albatros, so well defined there by the two supra-occipital ridges behind, the two temporal ridges at the sides, and the two converging posterior boundaries of the supra-orbital glandular fossæ in front. There is no sudden depression of the frontal region in the skull of the Albatros; the nostrils are near the upper surface of the basal third of the beak in the Albatros; and the Dodo's cranium is thrice as broad in proportion to the breadth of the mid-part of the mandible as in that of the Albatros.

More satisfactory evidence of the affinities of the Dodo was obtained from a comparison of the bones of the foot, which have recently been very skilfully and judiciously exposed by the able Curator of the Ashmolean Museum.

The tarso-metatarsal bone most resembles in its thickness and general proportions that of the Eagles, especially the great Sea-Eagles (*Haliaeetus*); it is much stronger than the tarso-metatarsus of

any of the *Vulturidæ*, or than that of the Cock, the *Crax*, or any of the *Gallinæ* or existing *Struthionidæ*; the stronger-footed species of *Dinornis* most resemble it in the general proportions of the tarso-metatarsus, but greatly differ in the particular configuration of the bone, and in the absence, or feebler indication, as in the subgenus *Palapteryx*, of the articulation for the metatarsal bone of the back-toe. The relative size of this bone is greater in the Dodo than in any other known bird. The Eagles make the nearest approach to it in this respect; as also in the shape of the hinder supplemental metatarsal, the breadth of its distal end, and its peculiar twist backwards and outwards, so as to form a bridge or pulley against which the flexor tendon of the hind-toe plays. This half-twist of the rudimental hind-metatarsus is feebly repeated in the *Gallinæ*, but the bone is much less expanded at its lower articular end, especially in the *Crax*; whilst the more typical *Gallinæ* are further distinguished from the Dodo by their spur.

The Apteryx is the sole existing Struthious bird which possesses the hind-toe; but it is very much smaller than in the Dodo, and the supporting metatarsal bone is devoid of the distal twist and expanded trochlea. The upper end of the tarso-metatarsus of the Dodo is remarkable for the great development of its calcaneal process, from which a strong ridge descends, gradually subsiding, half-way down the bone. The posterior surface of the calcaneal process is broad, triangular, vertically grooved and perforated at its base. In the Eagle the corresponding calcaneal process is a compressed, subquadrate ridge, whose base of attachment is not much longer than the obtuse end, and this is neither grooved nor perforated. In the *Cathartes Californianus* the calcaneal process is thicker than in the Eagle, shaped more like that of the Dodo, with a ridge descending upon the metatarsus, but it has a double groove behind.

In the Common Cock the calcaneal process more resembles that in the Dodo than the Vulture's does, but it is not so broad.

With regard to the first or proximal phalanx of the hind-toe, that of the *Haliaetus* is larger and broader, especially at its base, stronger in proportion to its length, but longer in proportion to the sustaining metatarsus.

In the Vultures the proximal phalanx is not only longer in proportion to the metatarsus, but is more slender than in the Dodo. The same bone is also longer and more slender in proportion to the small supporting metatarsal bone in the Cock, the *Crax*, and all other *Gallinæ*; in fact, the Dodo is peculiar among Birds for the equality of length of the metatarsus and proximal phalanx of the hind-toe. With regard to the three trochlear extremities of the principal coalesced metatarsals, the middle one in all *Gallinæ* is longer in proportion than in the Dodo, in which the inner one is nearly as long as the middle one, the outer one being the shortest. In the Eagle the inner division is of quite equal length with, or is longer than the middle trochlea; the proportions of the three trochleæ in the Vultures corresponding best with those in the Dodo. Another character by which the Dodo resembles the Vulture more than the Eagle is

manifested by the proportions of the proximal phalanx of the second toe (innermost of the three anterior ones); this is very short, and is often anchylosed to the second phalanx in the Eagles: it is almost as long in the Vultures as in the Dodo.

Upon the whole, then, the Raptorial character prevails most in the structure of the foot, as in the general form of the beak, of the Dodo, compared with Birds generally; and the present limited amount of our anatomical knowledge of the extinct terrestrial Bird of the Mauritius would lead to support the conclusion that it is an extremely modified form of the Raptorial Order.

Devoid of the power of flight, it could have had small chance of obtaining food by preying upon the members of its own class; and if it did not exclusively subsist on dead and decaying organized matter, it most probably restricted its attacks to the class of Reptiles, and to the littoral fishes, Crustacea, &c.

The author concluded by recommending search to be made for bones of the Dodo in the superficial deposits, the alluvium of rivers, and the caves in the islands of Mauritius and Rodriguez; little doubting that an active exploration would be as richly rewarded as similar investigations have been in the islands of New Zealand, by the recovery of the remains of the great extinct species of terrestrial birds which formerly inhabited them.

August 25,—R. C. Griffith, Esq., in the Chair.

The following communication was read:—"On the Relation of the *Edentata* to the Reptiles, especially of the Armadillos to the Tortoises." By Edward Fry.

The dissections of two specimens of Tortoise, of which I have been unable to recognise the species with certainty, induced me to believe that those animals are allied to the Armadillos. Continuing this investigation, and extending it to the *Edentata* in general, I arrived at the conclusion that they are allied to the Reptiles. As some points of affinity have occurred to me which I have not seen noticed as such, I believe that a short sketch of the subject may not be devoid of interest; and as Professor Owen has intimated his belief that the *Edentata* are allied to Birds rather than to any other class, I shall conclude my paper with a consideration of the arguments adduced by him hereon.

Such subjects as the one I shall attempt to investigate are of so high an interest to the zoologist, that any one contributing in the least degree to elucidate them may hope for indulgence.

I regret not being able to ascertain the names of the species of Tortoises which came under my notice, but trust that this omission will not materially deduct from the interest of the subject.

Sect. I. *Of the Relation of the Genera Dasypus and Testudo.*

1. In the Tortoise the oesophagus is large and muscular, admitting bodies of great size in proportion to the mouth. From the structure of the mouth it is incapable of masticating the food, whence arises the necessity of a large and muscular oesophagus. Professor Owen has remarked a similar structure, and adduced the same final cause

in the Armadillo, *Dasyus peba*. In his paper in the Proceedings of the Zoological Society, i. 144, he says: "The muscular parietes of the pharynx and cesophagus are very thick, for from the nature of the teeth, small, conical and wide apart, the food can undergo but little comminution in the mouth, and hence the necessity of additional power for propelling imperfectly divided substances into the stomach."

2. In concordance with the structure of the mouth, the stomach of the Tortoise is strong and muscular: in the larger of the two individuals I dissected so remarkably so, as would forcibly have reminded a casual observer of the gizzard of birds. The stomach of the Armadillos, though of a globular form, is similar in structure; so much so, that Prof. Owen speaks of it as "a structure analogous to the gizzard of birds," *Ibid*. As in the *Dasyodæ* (Zool. Proc. i. 142 & 154), so in the larger specimen of the Tortoise, the coats of the stomach, generally thick, are especially so at the pylorus.

3. In the smaller species of Tortoise I observed that the colon is prolonged beyond the insertion of the ileum, so as to form a short cæcum, as described by Martin in his account of the *Testudo græca* (Zool. Proc. i. 63 & 74). In my larger species there was no cæcum; such is also the case with the *Testudo indica* (Zool. Proc. i. 47). In the *Testudo tabulata* "there is no trace of appendix cæci" (Holberton in Zool. Journal, iv. 325). On the other hand, Prof. Owen has ascertained the presence of a cæcum in another species of Tortoise, *Emys concentrica*, Leconte (Zool. Proc. i. 74). From these accumulated observations, it becomes evident that the presence of a cæcum is a varying character in the Tortoises. A similar variability in this structure has been remarked by Prof. Owen in the genus *Dasyus* (Zool. Proc. i. 156).

4. A great tendency to ankylose parts usually distinct, and to ossify others generally cartilaginous, is observable in the Tortoise in the ribs, in the dorsal vertebræ, in the scapulæ and clavicles, in the component parts of the pelvis, in the sternal cartilages, and in the parts forming the plastron. In the Armadillos it may be remarked in the cervical vertebræ, in the sternal portions of the ribs, and in the manubrium and clavicular processes (Owen in Zool. Proc. ii. 134). In the Sloths also it is especially evident in the ankylosis of the bones of the hand.

5. Hence results a similarity of locomotion in the Tortoises and Armadillos; so that the following extract from Prof. Owen, referring to the motion of the latter animals, will apply almost equally well to that of the former: "Every one who has seen the living Armadillo running about the open plot of ground in the Society's Gardens must have been struck with the machine-like manner in which the body is carried along. The short legs are almost concealed, and their motions are not accompanied by any corresponding inflections of the spine, the two extremities of the trunk not being alternately raised and depressed as in the quadrupeds which move by bounds" (Zool. Proc. ii. 135).

6. The anterior articular processes of the vertebræ of the Armadillo, especially of the hinder dorsal and the lumbar regions, assist as

"strutts or braces" in the support of its heavy shell; whilst in the Tortoise a similar object is effected by the small osseous supports which proceed from its anchylosed spine.

7. Both in the Armadillo and Tortoise the ossa ilia appear to serve as additional supports to the shell.

Sect. II. *Of the Relation of the Edentatous Mammalia to the Reptiles.*

1. In the Two-toed Anteater the ribs are so broad as to overlap each other like tiles (Cuvier, Lectures on Comparative Anatomy, translated by Ross, 1802, vol. i. p. 209). This is, I believe, the nearest resemblance amongst other Vertebrata to the bony case of the Tortoises. In the Armadillo the first pair of ribs are broader than they are long (Owen, Zool. Proc. ii. p. 135).

2. In the large number of the ribs of the Unau, we have what Prof. Owen has termed a lacertine character (on Mylodon, p. 166).

3. Like the Tortoises, &c. amongst Reptiles, the Anteaters and Pangolins are deprived of teeth; whilst those Edentata which are furnished with them approximate to the dentition of some of the Reptilia in the uniform character of the series; and in the subgenus *Priodontes* of Fred. Cuvier in the extremely large number, namely eighty-eight or ninety-six in all.

4. The Edentata, like the Reptiles, are remarkable for the propensity to develop coats of mail of various kinds; sometimes continuous; in other instances, of detached and separate scales; sometimes, to continue the simile, like plate-armour; sometimes like scale-armour. The Armadillos, the Chlamyphorus, the Pangolins, and some of the extinct Megatheroids, exhibit this amongst the Edentates; whilst almost all the Reptiles partake in measure of this character.

5. The Anteater and Manis are destitute of the power of emitting sounds (Blumenbach's Anatomy, translation by Lawrence, 1807, p. 278). This incapacity approximates them to the Reptiles, and particularly distinguishes them from Birds and most of the Mammalia. In this character however most of the Marsupialia partake.

6. Waterton, in his 'Wanderings,' furnishes us with a highly graphic description of the habits of the *Myrmecophaga jubata*. From the extracts I shall make, the similarity of this animal to the Reptiles will be manifest in three important points, viz. the slowness of its movements, the tenacity with which it retains any object which it has seized, the length of time which it can pass uninjured without food; and probably a fourth—the tenacity of life and muscular power. The Tortoises exhibit these phenomena of muscular irritability perhaps as well as any genus amongst the Reptiles.

"He (*Myrmecophaga jubata*) cannot travel fast, for man is superior to him in speed. . . . Whenever he seizes an animal with these formidable weapons (his claws), he hugs it close to his body and keeps it there till it dies through pressure or through want of food. Nor does the Antbear in the meantime suffer much from want of aliment, for it is a well-known fact that he can go longer without food than

any other animal, excepting perhaps the Land Tortoise. . . . The Indians have a great dread of coming in contact with this animal, and after disabling him in the chase, never think of approaching him till he is quite dead." (Waterton's Wanderings in South America, 171.)

That muscular irritability exists to a similar extent in the Sloths will be proved by the following extract:—

"Cor motum suum valdissime retinebat postquam exemptum erat a corpore, per semihorium; exempto corde, ceterisque visceribus multo post se movebat et pedes lente contrahebat sicut dormituriens solet." (Pison. Hist. Bras. p. 322, quoted by Buffon; translation by Smellie, 1791, vol. vii. p. 161.)

7. In the Sloths and Weasel-headed Armadillo the absence of the os tincæ, and the consequent formation of a single tube by the uterus and vagina, approximate these organs very nearly to the oviduct of the Reptilia (see Owen, Zool. Proc. ii. 131, and on the Generation of Marsupial Animals in Phil. Trans. 1834, p. 365).

In the genera *Bradypus*, *Dasybus*, *Manis* and *Myrmecophaga*, "the utero-sexual canal," to use the words of the last-quoted memoir, "is formed, as in the Tortoises, by a continuation of the urethra or urinary bladder, into which the genital tube opens by a small orifice."

8. There is yet another highly important character, one indeed which has probably a relation to the preceding, which displays the intimate relationship of the Edentata and Reptiles, namely the extreme simplicity of the brain. In the Armadillos, Manises and Ant-eaters, the cerebral hemispheres are devoid of convolutions, whilst in the Sloth they present a few anfractuosities (Owen, Phil. Trans. 1834, p. 361).

9. Professor Owen says, in his elaborate memoir on the *Myiodon robustus*, that the presence of a persistent formative organ of the teeth of the Megatheroids indicates a property in which they resembled the Reptiles, viz. longevity (p. 166). And again, the intimate structure of the soft dentine of the teeth of the Iguanodon resembles that of the extinct Megatherium and of the recent Sloths (Owen's Odontography, p. 251). Is it not an idea which forcibly impresses on us the unity of the great plan of nature, that had a comparative anatomist existed in the days of the Megatherium and Iguanodon, he might have discovered from an examination of their teeth two common characters, and might thence perhaps have inferred those very relations which in the present paper I have been seeking to enforce with regard to their congeners of another age—almost another world?

10. It is well known that the blood-corpuscles of the Reptiles are remarkably large; the Sloths are the largest yet known amongst the Mammalia, with the single exception of the Elephant. Perhaps however this may be a character of little importance in elucidating the natural affinities of groups, as we find the corpuscles of the Armadillo rather smaller than Man's, and those of the Monotremata of about the same size as the human (Gulliver on Blood-corpuscles, Zool. Soc., October 14, 1845).

Sect. III. *Of the Arguments adduced by Professor Owen for believing the Edentata to be allied to Birds.*

I propose first to enumerate these arguments, and then to consider them more particularly. They are to be found in Professor Owen's interesting papers on the anatomy of the Six-banded and Weasel-headed Armadillos in the Proceedings of the Zoological Society of London, so often referred to and quoted in this paper, and are as follows:—1. The presence of two cæca in the *Dasypus 6-cinctus* and *Myrmecophaga didactyla*. 2. "The gizzard-like structure exhibited in the tendinous external appearance and thickened muscular coat of the stomach of the *Dasypoda*," and a still nearer approach in the stomach of the Manis. 3. The presence of a similar structure in the *Myrmecophagæ*, accompanied by the habit of swallowing small pebbles for the purpose of destroying the vitality of the insects which form their food. 4. The similarity of the mucous glands about the os hyoides of the Anteaters to those follicles in the Woodpeckers, which represent amongst Birds the conglomerate salivary glands of the Mammalians; and the lubrication of the extensile tongue. 5. The abnormal number of cervical vertebræ in the Three-toed Sloth. 6. Prof. Owen concludes this line of argument in the following words: "The transition is indeed nearly completed by the Monotremata, for of the two genera contained in this order, *Echidna* presents us with the quills, and *Ornithorhynchus* with the beak of a bird; and it is far from being proved that the mode of generation is not the same." 7. The form of the pubis of the Armadillo indicates "that only a small portion of what usually constitutes the symphysis is here joined to its fellow, viz. the anterior angle;" and in *Chlamyphorus* and *Myrmecophaga didactyla* the ossa pubis remain entirely separate, as is the case in Birds. The pelvis likewise resembles theirs "in the great breadth of the posterior part of the sacrum, the angles of which are anchylosed to the spines of the ischia, and convert the great ischiatic notches into complete foramina."

1. The occurrence of double cæca is a remarkable point of affinity to Birds; but we have previously shown that the presence of cæca is a variable character in the Tortoises, as in both *Dasypus* and *Myrmecophaga*, so that the characters furnished us by this organ seem to approximate them equally to Birds and Reptiles.

2. We have shown the structure of the stomach in the Tortoises to be gizzard-like. This is also the case in *Crocodylus acutus* (Owen in Zool. Proc. 1830, p. 139). Hence the stomach of the Edentata presents us with an equal analogy to Reptiles and Birds.

3. The habit of the *Myrmecophaga* of swallowing small pebbles to increase the trituration of the gizzard, is certainly analogous to that of the Gallinaceous Birds. But the same has been remarked in the Egyptian Crocodile by Professor Geoffroy St. Hilaire, and in the sharp-nosed species by Prof. Owen (*ubi supra*). As the gizzard-like structure and pebbles of the *Myrmecophaga* are adapted to the digestion of animal food, as in the Reptilia, and not of vegetable, as in the Gallinaceous Birds, I consider the resemblance of the Edentata in these respects to be greater to the former than the latter animals.

4. The salivary glands of the Chameleon, if not formed on exactly the same type as those of the Anteaters, are at least similar in the office they perform.

5. The abnormal number of cervical vertebræ in the Ai approximates the Edentata equally to Reptiles and Birds.

6. The Monotremata, which Professor Owen in the passage I have quoted seems to look upon as the terminal link between the Edentata and Birds, are certainly more nearly allied to Reptiles than to Birds, and have indeed been considered so by himself, as will be manifest from the following extract from a letter of that gentleman quoted in Kirby's *Bridgewater Treatise*, vol. ii. p. 432:—"Dissections of most of the genera of Marsupians have tended to confirm in my mind the propriety of establishing them as a distinct and parallel group, beginning with the Monotremes, which I believe to lead from Reptiles, not Birds." Again, in his paper '*On the Young of the Ornithorhynchus paradoxus*,' Zool. Trans. vol. i. p. 221, he very distinctly states the weight of evidence to be in favour of the relation of the Monotremates to the Reptiles rather than Birds; so that in all probability he has altered his views on this subject since 1830.

The evidence produced above is conclusive for my purpose, and precludes the necessity of discussing the analogies of the Monotremata. But as Prof. Owen has alluded to the beak of the *Ornithorhynchus* as that "of a bird," it may not be irrelevant to show in how many important particulars the two structures differ. "This structure," says Sir Everard Home, speaking of the organ in question, "differs materially from the bill of a Duck, and indeed from the bill of all birds, since in them the cavities of the nostrils do not extend beyond the root of the bill; and in their lower portions, which correspond to the under jaw of quadrupeds, the edges are hard, to answer the purpose of teeth, and the middle space is hollow, to receive the tongue" (Home on Head of *Ornithorhynchus*, Phil. Trans. 1800). When to this diversity of structure we add the difference of use, we shall see that however strong may be the resemblance at first sight, it is perhaps more imaginary than real. From the description above-quoted, we learn that the beak of the *Ornithorhynchus* is incapable, from the general flexibility of its structure, of taking firm hold of any object; but that the marginal lips being brought together, the prey is sucked into the mouth.

Perhaps too the similarity of the spines of the *Echidna* to the quills of a bird is not very close.

7. The pelvis of some Edentata certainly resembles that of Birds in a remarkable degree.

I have thus endeavoured to show that many of the structures in the Edentata, adduced by Prof. Owen as offering relations to Birds, are equally so to Reptiles; whilst those that lead us to the former class are not of equal number or importance to those that conduct us to the latter.

I am fully aware that the scope and conduct of my investigations have been defective; but so far as they extend they appear to me to

prove simply this, viz. that the Edentata are allied to the Reptiles, and that more nearly than to Birds.

It would have been absurd to expect any other result from this investigation than such as the present: a group is never related to one other group only: "The true affinities of organic structures branch out irregularly in all directions."

I cannot conclude without observing, that it is highly remarkable and interesting that affinities should be found to prevail amongst creatures often remotely situated one from the other in the Animal Kingdom; that these relations often appear subtle and irrespective of functional similarity; and that whilst their final cause will probably ever remain unknown to man, we cannot consider them without deeply appreciating the order, the unity and dependence which prevail throughout all parts of nature.

EDW. FAY.

MISCELLANEOUS.

A new genus of Sea-Snake from Port Essington.

By J. E. GRAY, F.R.S.

THE snake here described formed part of the extensive collection brought home by Mr. Jukes, the naturalist to H.M.S. Fly. It is remarkable as having the compressed shape, the short blunt head, the peculiar lunate valvular nostrils on the upper surface of the nose, the small superior eyes, the head-shields and the compressed tail of *Hydrus*, but differs from it in having large polished smooth keelless scales, and the broad band-like ventral shields of the vermiform terrestrial snakes (*Elaphina*). In this respect it agrees with the genus *Aipisurus*, but it is at once distinguished from that genus by the ventral shields being broader in proportion and acutely keeled along the middle line, and by having the head-shields of *Hydrus*; in fact it is exactly intermediate between the genus *Hydrus* of *Hydridae* and *Aipisurus* of *Elaphina* in *Colubridæ*. It may be called *HYPOTROPIS*.

Scales large, smooth, six-sided; head short, truncated in front; nasal large, with the lunate nostrils in the middle of their hinder part; crown shields small, superciliary numerous, labial shield high, loreal none; throat scaly; ventral shields broad, band-like, folded together and keeled in the middle, notched behind at the keel; tail compressed, covered with large broad six-sided smooth scales.

Hypotropis Jukesii. Olive, yellowish below.

Hab. Sea, near Darnley Islands. "Merad sand-bank, while at anchor, May 1845."

On the Pulmograde Medusæ of the British Seas.

By Prof. E. FORBES*.

At the Birmingham Meeting in 1839, the author, in conjunction with Prof. Goodsir, brought forward a first essay towards an investigation of the British Acalephæ, selecting the ciliograde species for illustration. Since that time he has yearly availed himself of every opportunity of pursuing the inquiry, but has abstained from publish-

* Read at the Southampton Meeting of the British Association.

ing, hoping to gain more complete knowledge of a difficult and much-confused branch of zoology. Having now however examined more than twice the recorded number of British Medusæ, and become acquainted with numerous new specific and several new generic forms of great interest to the naturalist, he ventures to lay before the Section an outline of the data in his possession. These data are in great part due to the opportunities afforded him by his voyages round the coasts of Britain with his friend Mr. M'Andrew. After pointing out the difficulties attending the study of these animals, and giving a brief view of the present state of the subject generally, Prof. Forbes insisted on the necessity in future of naturalists abstaining from publishing imperfect observations respecting them, and urged the adoption of the descriptions of Milne Edwards, Sars and Will as models for those who were ready seriously to engage in the study. He called attention to the important observations on their development lately made by his friend Prof. Reid of St. Andrews, and expressed a hope that ere long the return of the Arctic expedition would bring a great mass of new materials of the most accurate description through the observations of Mr. H. Goodsir. In grouping the British species, Prof. Forbes calls attention to the mutual correspondence of certain characters; viz. of the condition of the reproductive, digestive and sensitive systems. He proposes to group all the British Medusæ under such as have hooded and such as have naked ocelli. The first character is combined with a conspicuous and comparatively complicated reproductive system, and a ramified gastro-vascular apparatus. All the Pulmograda with naked ocelli have simple vessels, with one exception,—a new and most beautiful generic form, the type of a subsection by itself. The remainder form three natural groups, as will be seen in the following general table, exhibiting the arrangement of the British Pulmograda Medusæ :—

1st Section.—Hooded-eyed; ramified gastro-vascular system.

1st Genus.—*Rhizostoma* (Cuvier). 1 species, *R. Aldrovandi*.

2nd Genus.—*Cassiopea* (Peron). 1 sp. *C. lunulata*.

3rd Genus.—*Pelagia* (Peron). 1 sp. *P. cyanella*, one of the most phosphorescent and beautiful of European Medusæ, now first announced as British, having been taken during the past month by Mr. M'Andrew and Prof. Forbes off the coast of Cornwall.

4th Genus.—*Chrysaora* (Peron). 1 sp. *C. hysoscella*.

5th Genus.—*Cyanea* (Peron). 2 sp. *C. capillata* and *C. Lamarchii*, both common; very large, stinging Medusæ.

6th Genus.—*Medusa* (Linnæus, Escholtz; *Aurelia*, Peron). 2 sp. *M. aurita* and *M. cruciata* (the latter is the Medusa so abundant in Southampton Harbour). It has white ocelli.

Many more spurious species of *Cyanea*, *Medusa* and other genera are recorded by Peron, Lesson and others, and enumerated as inhabitants of the British Channel. After careful consideration, they have been rejected as mere varieties from this arrangement. Certain forms belonging to this section recorded by Pennant and Templeton are also rejected as too imperfectly observed to be of any service to science.

2nd Section.—Palmograda with naked ocelli.

1st Family.—Vessels branched.

7th Genus.—*Willisia* (new sp. *W. stellata*, founded on a beautiful little Medusa with six starlike ovaries and branched vessels). It is abundant in the British Channel and on the west coast of Scotland.

2nd Family.—Vessels simple; ovaries convoluted and lining the pedunculated stomach..

8th Genus.—*Turris* (Lesson; *Eirene*, Escholtz), 2 sp. *T. digitale* of O. Fabricius (Zetland) and *T. neglecta*, Lesson, the *Cyanea coccinea* of Davis; British Channel. Very highly organized Medusæ, closely approaching Actinise.

9th Genus.—*Saphenia* (Escholtz). 1 sp. *S. diadema*, Peron. Devon. Zetland.

10th Genus.—*Oceania* (Peron—*Tiara*, Lesson). 4 sp., one being the "*Geryonia octona*" of Fleming; the other three are new.

3rd Family.—Vessels simple; ovaries in the course of the vessels, on the subumbrella.

a.—With eight vessels.

11th Genus.—*Æquorea* (Peron), or perhaps deserving of a distinct appellation. 1 sp., common on the Scotch coast; it is the "*Melicertum campanulatum*" of Ehrenberg (not of Escholtz), "*Oceania octocostata*" of Sars, and "*Thaumantias Milleri*" of Mr. Landsborough, and "*Æquorea octocostata*" of Lesson. It has long yellow ovaries.

12th Genus.—*Circe* (Mertens). Ovaries 8, minute. 1 sp. *C. rosca*. Zetland, new.

b.—With four vessels.

13th Genus.—*Thaumantias* (Escholtz); ovaries four, ovate, clavate or linear, stomach short; 19 British species, of which 12 are new and undescribed. All very distinct from each other.

14th Genus.—*Slabberia* (new), founded for a singular little Medusa remarkable for its extremely linear ovaries, long proboscis, and the development of an ocellated bulb at the end as well as at the base of each tentacle: *S. halterata*; coast of Cornwall.

15th Genus.—*Geryonia* (Peron). 1 sp., new, *G. appendiculata*. British Channel.

16th Genus.—*Tima*? (Escholtz) *T. Bairdii* of Johnston; common on the east coast of Scotland.

4th Family.—Vessels simple; ovary in substance of peduncle. Gemmiparous.

A.—Peduncle with lateral lobes; tentacula fasciculated.

17th Genus.—*Bougainvillia* (Lesson—*Hippocrene*, Brandt), with 4 fascicles of tentacles. 3 sp., 2 new.

18th Genus.—*Lissia* (new, with 8 fascicles of tentacles and unequal lobes to peduncle), founded for the *Cytis octopunctata* of Sars, which, with two other undescribed species, inhabits the Zetland seas.

B.—Peduncles inflated; tentacula not fasciculated.

19th Genus.—*Modeeria* (new). 1 sp. from the Hebrides.

C.—Peduncle elongate; tentacula not fasciculated.

a. With four tentacles.

20st Genus.—*Sarsia* (Lesson). 4 British sp.

b. With one tentacle only developed.

21nd Genus.—*Steenstrupia* (new). 3 sp.

In all there are fifty species of British Pulmograda known to Prof. Forbes, excluding doubtful forms and varieties. Of these nine only had been previously recorded as British, and of the remainder, all but five are undescribed.

METEOROLOGICAL OBSERVATIONS FOR AUG. 1846.

Chiswick.—August 1. Uniformly overcast: hot and dry: 2 p.m. almost continued thunder: at 3 p.m. rain in torrents: at 4^h 40^m vivid lightning and rain, mixed with large hail: overcast at night 2. Sultry: thunder and rain: clear. 3. Rain: showery. 4. Cloudy and fine. 5. Heavy rain. 6. Cloudy and fine. 7. Overcast. 8, 9. Cloudy and fine. 10, 11. Very fine. 12. Rain: cloudy. 13. Cloudy: heavy rain. 14. Very fine. 15. Clear: fine: rain. 16, 17. Cloudy: fine. 18. Fine: rain. 19. Fine: drizzly. 20. Overcast: rain. 21. Densely clouded: rain. 22—25. Cloudy and fine. 26. Overcast. 27. Fine. 28—31. Very fine.

Mean temperature of the month 64°·16

Mean temperature of Aug. 1845 59°·30

Average mean temperature of Aug. for the last twenty years 62°·23

Average amount of rain in Aug. 2·41 inches.

Boston.—Aug. 1. Cloudy: rain p.m., with thunder and lightning. 2. Fine: rain p.m. 3. Fine: rain, with thunder and lightning a.m. 4. Fine: rain and lightning p.m. 5. Cloudy: rain p.m. 6, 7. Cloudy. 8. Fine. 9. Cloudy: rain a.m. 10. Fine: rain p.m. 11, 12. Fine. 13. Cloudy: whirlwind, with rain a.m. 14. Fine. 15. Fine: rain a.m. 16. Fine. 17. Fine: rain early a.m. 18. Fine. 19. Rain. 20. Fine: rain a.m. and p.m. 21. Rain. 22. Cloudy. 23. Cloudy: rain p.m. 24—27. Cloudy. 28. Fine. 29. Cloudy. 30, 31. Fine. —The past month has been extraordinary warm.

Sandwich Manse, Orkney.—Aug. 1. Cloudy: fine. 2. Fog: hot: fine. 3. Bright: hot: fog. 4. Clear: hot: fog. 5. Bright: cloudy. 6. Fog: cloudy. 7. Cloudy. 8. Bright: fog. 9. Fog: rain. 10. Bright: rain: clear. 11. Showers: clear. 12. Showers: cloudy. 13. Rain. 14. Bright: clear. 15. Rain. 16. Showers: small rain. 17. Cloudy: fine. 18. Cloudy. 19. Bright: hot: fog. 20. Cloudy: rain. 21. Cloudy: damp. 22. Damp: drizzle. 23. Cloudy. 24. Bright: cloudy. 25. Clear: aurora: fine. 26. Clear: fine. 27. Clear: aurora: fine. 28. Clear: fog. 29. Cloudy. 30. Bright: rain. 31. Rain: clear.

Mean temperature of the month 58°·82

Mean temperature of Aug. for nineteen preceding years 54°·76

Mean temperature of Aug. 1845 53°·16

Applegarth Manse, Dumfriesshire.—Aug. 1. Remarkably warm. 2. Very fine. 3. Very fine: thunder. 4. Fine: one shower. 5. Heavy shower: fine. 6. Fair and fine. 7. Rain, heavy: thunder. 8. Wet: thunder. 9. Wet p.m.: fair a.m. 10. Showers. 11, 12. Slight showers. 13. Very heavy rain: flood. 14. Fine: one shower. 15. Showers p.m. 16. Wet a.m.: cleared. 17. Very fine harvest day. 18. Rain nearly all day. 19. Fine harvest day. 20. Fine harvest day: thunder. 21—23. Fine harvest days. 24, 25. Fine harvest days: threatening. 26, 27. Fine harvest days: clear. 28, 29. Fine harvest days: threatening. 30. Fine harvest day. 31. Rain: cleared p.m.

Mean temperature of the month 61°·25

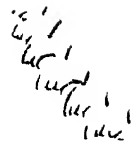
Mean temperature of Aug. 1845 56°·4

Mean temperature of Aug. for twenty-three years 57°·0

Mean rain in Aug. for eighteen years 3·61 inches.

Microscopical Observations made by Mr. Thompson at the Garden of the Horticultural Society at CHISWICK, near London, by Mr. Veall, at Boston; by the Rev. W. Dunbar, at Appleton's Messrs, DUMFRIES; and by the Rev. C. Clouston, at Sandwick Messrs, ORKNEY.

Days of Month.	Barometer.						Thermometer.						Wind.				Rain.							
	Chilwick.		Dunstable-shire.		Ormsby Sandwiche.		Chilwick.		Dunstable-shire.		Ormsby Sandwiche.		Chilwick.		Dunstable-shire.		Ormsby Sandwiche.		Chilwick.		Dunstable-shire.		Ormsby Sandwiche.	
	Max.	Min.	9 a.m.	3 p.m.	9 a.m.	3 p.m.	Max.	Min.	9 a.m.	3 p.m.	Max.	Min.	9 a.m.	3 p.m.	Max.	Min.	9 a.m.	3 p.m.	Max.	Min.	9 a.m.	3 p.m.	Max.	Min.
1846.																								
Aug.																								
1.	29.752	29.670	29.18	29.85	29.79	30.03	29.99	29.99	60	70	77.5	58.5	59	calm	ene.	ene.	calm	1.23						
2.	29.830	29.643	29.05	29.74	29.75	30.03	29.99	29.99	77	73.5	76	63	66	calm	ene.	ene.	calm	.05						
3.	29.925	29.668	29.24	29.78	29.80	30.36	29.98	29.98	81.	73.5	78.5	63	70	calm	e.	e.	calm	.04						
4.	29.946	29.683	29.34	29.83	29.85	30.03	30.00	29.96	79	70	73.5	58	68	e.	e.	e.	calm	.85						
5.	29.980	29.687	29.34	29.89	29.89	30.00	30.00	29.96	80	68	72	56	65	e.	e.	e.	calm	.37						
6.	29.906	29.835	29.38	29.90	29.61	30.36	29.91	29.91	83	64	68.5	52	61.5	e.	e.	e.	calm	.43						
7.	29.747	29.662	29.34	29.76	29.61	30.36	29.91	29.91	83	66	66.5	58	62	e.	e.	e.	calm	.04						
8.	29.726	29.701	29.07	29.58	29.58	30.36	29.91	29.91	74	55	68.5	58	62	e.	e.	e.	calm	.01						
9.	29.969	29.844	29.19	29.65	29.75	30.36	29.91	29.91	71	58	67	59	61.5	e.	e.	e.	calm	.01						
10.	30.022	29.867	29.38	29.76	29.77	30.36	29.91	29.91	71	55	66	63	54.5	e.	e.	e.	calm	.02						
11.	30.073	30.039	29.37	29.76	29.82	30.36	29.91	29.91	73	57	66	63	54.5	e.	e.	e.	calm	.02						
12.	30.066	30.038	29.49	29.92	29.83	30.36	29.91	29.91	75	51	66	64	55	e.	e.	e.	calm	.02						
13.	29.792	29.692	29.16	29.43	29.59	30.36	29.91	29.91	66	44	65	61.5	54	e.	e.	e.	calm	.01						
14.	29.912	29.870	29.38	29.75	29.75	30.36	29.91	29.91	77	49	60.5	64	55	e.	e.	e.	calm	.02						
15.	29.740	29.716	29.22	29.55	29.53	30.36	29.91	29.91	79	50	67	65	53	e.	e.	e.	calm	.07						
16.	29.863	29.792	29.19	29.58	29.58	30.36	29.91	29.91	70	53	64	66	57	e.	e.	e.	calm	.07						
17.	29.855	29.746	29.39	29.54	29.53	30.36	29.91	29.91	72	54	66	56	60	e.	e.	e.	calm	.07						
18.	29.570	29.538	29.00	29.39	29.44	30.36	29.91	29.91	70	53	64	66	57	e.	e.	e.	calm	.07						
19.	29.648	29.578	29.00	29.57	29.61	30.36	29.91	29.91	72	54	66	56	61	e.	e.	e.	calm	.07						
20.	29.829	29.720	29.23	29.64	29.64	30.36	29.91	29.91	70	52	60	70	51	e.	e.	e.	calm	.07						
21.	29.954	29.744	29.23	29.64	29.64	30.36	29.91	29.91	74	60	70	51	60.5	e.	e.	e.	calm	.07						
22.	29.965	29.994	29.49	29.96	29.99	30.03	30.00	30.00	70	54	61	68	56	e.	e.	e.	calm	.07						
23.	30.132	30.082	29.44	30.08	30.11	30.19	30.06	30.06	68	62	65	48	62	e.	e.	e.	calm	.43						
24.	30.210	30.138	29.62	30.16	30.20	30.26	30.23	30.23	71	59	65.5	63	59	e.	e.	e.	calm	.47						
25.	30.210	30.194	29.70	30.24	30.21	30.26	30.31	30.31	68	63	61.5	54	58.5	e.	e.	e.	calm	.01						
26.	30.148	30.051	29.60	30.17	30.08	30.21	30.26	30.26	69	63	61.5	54	57.5	e.	e.	e.	calm	.04						
27.	29.996	29.960	29.48	30.05	30.00	30.14	30.09	30.09	59	52	60.5	68	46	e.	e.	e.	calm							
28.	29.936	29.921	29.38	30.05	30.05	30.13	30.18	30.18	76	57	64.5	69	46.5	e.	e.	e.	calm							
29.	30.014	29.993	29.34	30.03	30.03	30.15	30.06	30.06	78	56	69	72	49	e.	e.	e.	calm							
30.	30.172	30.095	29.45	30.00	30.02	30.00	30.00	30.00	72	48	65	70	50	e.	e.	e.	calm	.02						
31.	30.176	30.132	29.54	30.00	30.18	30.08	30.07	30.07	79	56	63	63	59	e.	e.	e.	calm	.32						
Mean.	29.935	29.868	29.32	29.822	29.828	29.912	29.916	29.916	74.29	54.03	65.8	68.2	54.4	60.48	57.17			4.45	3.08	4.85	2.91			



THE ANNALS

AND

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No. 120. NOVEMBER 1846.

XXIX.—*Notices of some new and rare British species of Naked Mollusca.* By JOSHUA ALDER and ALBANY HANCOCK*.

[With a Plate.]

1. *Description of a small Mollusk belonging to the order Infero-branchiata* (Pl. IV. figs. 1, 2, 3).

IN the month of May 1845 we found on the shores of Torbay a very minute molluscous animal of a peculiar appearance, which we had not before met with. It was feeding upon a small green conferva in pools near high-water mark, and was only discernible to the naked eye as a small black spot. On taking a piece of the conferva home, and placing it in a glass of sea-water, two or three of these little creatures crept out of their ambush, and were found on the sides of the glass, or swimming inverted upon the top of the water. On applying a lens we were immediately struck with the similarity of their appearance to the animals figured by M. de Quatrefages in the 'Annales des Sciences Naturelles,' under the generic names of *Pelta* and *Chalidis*, and placed as the lowest forms of his new order *Phlebenterata*. As these were the genera upon which that naturalist founded his theory of extreme degradation from the typical form in the Mollusca, we immediately saw that our little animal must prove interesting in that point of view, and deserving of a careful examination. A slight inspection of its external characters, however, was sufficient to show that our captive at least did not partake of that degradation from the Molluscan type which M. de Quatrefages describes in his species, and that, tentacles excepted, it possessed all the external organs usually found in the class *Gasteropoda*. The branchiæ formed three small plumes, placed under the posterior part of the cloak a little to the right of a central tubular anus; thus bringing the species within the order *Inferobranchiata* of Cuvier. Its characters are as follows:—

Body limaciform, elongated, smooth, about two lines long.

* Read at the Meeting of the British Association, Sept. 14, 1846; and communicated by the authors.

Cloak a little indented in front, nearly straight at the sides, and slightly rounded behind: the general colour is black, sprinkled with minute points of brown, but the front part of the cloak corresponding to the head is buffish fawn-coloured towards the sides, and black in the centre only. On this part are placed two largish eyes, surrounded by a pale ring. Behind the eyes and at the termination of the fawn-coloured part, a curved line of small white spots crosses the cloak, giving the animal the appearance of having the head detached from the back; but this is in appearance only, the surface of the cloak being continuous. A suboval fawn-coloured patch, also bordered with white spots, terminates the cloak behind. Under the posterior margin of the cloak in the medial line is situated the anus, and close to it on the right side are three small, slightly pinnate branchial plumes, generally projecting a little beyond the cloak. The tail extends about one-fourth the length of the body beyond this, and terminates in an obtuse point. *Foot* yellowish, tinged with brown or black, and with a few opaque white spots. It is rounded in front and does not extend so far forward as the cloak: its sides are nearly parallel, broader than the cloak and usually folded up towards it. Organs of generation on the right side.

The head and shoulders are clothed with large vibratile cilia, the action of which could be observed with a powerful pocket-lens: the sides of the foot are also ciliated as well as the back. A regular pulsation was observed through the cloak, confined to a small portion of the back a little in advance of the branchial plumes,—the usual position of the heart,—from which we inferred the presence of that organ. The pulsations were fifty to sixty in a minute. As we had the opportunity of examining only one specimen microscopically, we were not able to make out the whole of the internal anatomy. The nervous ganglions had much the general appearance of those of the Nudibranchs; the eyes had a lens, and were regularly formed; the auditory capsules were closely attached to the ganglions, and contained one large otolith each. The tongue was strap-shaped and covered with spines; and a little behind it was a curious dental apparatus, similar to what is described by M. de Quatrefages in the stomach of his genus *Pelta*, and apparently constituting a kind of gizzard. It consisted of four portions, each bearing six denticulated teeth. We cannot speak with certainty respecting the biliary organ, though from the manner the creature slipped when pressed between the plates of the compressor, we have little doubt that it possessed a firm and bulky liver. The other viscera were not made out.

On comparing our animal with the genus *Pelta*, we find the resemblance of external form so great as almost to amount to identity. The head in that genus, however, is described to have

two lobes, which meet in the medial line behind. This is not exactly the case with ours, but the front is very variable in outline, according to the will or position of the animal; and as it is a little sinuated in the centre, it frequently assumes a bilobed appearance, and the line of white spots mentioned above gives an apparent continuation of the outline of the head across the medial line, similar to what is represented in M. de Quatrefages' figure. The form of the cloak and the dark line passing from it to the tail are the same in each. On turning to the internal characters we find the same peculiar gizzard, or dental armature of the stomach, as described in the French species, and some of the other parts are not very dissimilar. But M. de Quatrefages states that his genus *Pelta* has neither branchiæ, heart nor anus, thus reducing it to a level with the inferior zoophytes. We must confess that we have always looked upon this extreme degradation of the Molluscan type with great suspicion, and the discovery of this species has tended not a little to strengthen our conviction that M. de Quatrefages' views are founded upon imperfect observations. We cannot indeed prove that our mollusk belongs to the same genus as the *Pelta ornata*, but sufficient has been stated to raise a presumption that it does so; and considering the great difficulty of examining these minute objects anatomically, the inability to detect an obscure organ must not be hastily taken as a proof of its non-existence. Indeed in one or two of the smaller specimens of our mollusk, we were ourselves unable to detect either branchial plumes or anal aperture. The latter we have no doubt existed; but with regard to the former, we think it probable that these animals in a young state undergo a progressive development, and that it is not until they have arrived at maturity that the branchial organs are fully developed, respiration in the meantime being carried on chiefly through the ciliated surface of the body.

There is yet another mollusk to which our species bears a very strong resemblance,—the *Limapontia nigra* of Dr. Johnston, described in Loudon's Magazine of Natural History, vol. ix. p. 79. The figure there given is a pretty fair representation of our animal, and the colour appears to be the same. Dr. Johnston was unable to detect any branchiæ, and the cloak, though mentioned as distinct from the foot, is not so represented in the figure. It is possible, however, that the species may turn out to be identical.

Were we inclined to construe generic characters rigorously, we should be quite justified in establishing a new genus for an animal so differently organized as we have shown this to be; but believing as we do that we see in our little mollusk the representative of two genera already described by naturalists, though, camelion-like, when again produced it turns out to be something different from what either party had supposed, we shall leave it

for the present to the decision of other umpires, only premising, that should our suspicions prove correct, the genus *Limapontia* of Johnston will take precedence of the *Pelta* of Quatrefages.

2. Descriptions of some new species of Nudibranchiata.

Nearly the whole of the species here described were obtained on an excursion to the Isle of Arran in May and June last. Among them is a second species of our new genus *Eumenis*, which, having been founded on a single individual, may by some have been considered to be imperfectly established. It is satisfactory therefore to have obtained another species, sufficiently distinct from that found in Torbay last year, yet at the same time confirming the characters we had previously given to the genus. Unfortunately in this instance again we only procured a single specimen.

Besides the Nudibranchs described below, we met with some other rare species, particularly the *Egires punctilucens*, hitherto only claiming a place in the British fauna from a specimen found on the south coast of Ireland by Professor Allman. Several specimens of this curious and beautiful mollusk were found among the rocks at Ardrossan on the Ayrshire coast, and on the shores of the Isle of Arran. It would thus appear to be diffused over the estuary of the Clyde, and this circumstance, together with some occasional variation in its colour, induces us to think that the *Doris Maura*, found by Professor E. Forbes on Devar Island, near Campbeltown, will prove to be a variety of this species. One of the most plentiful species of *Eolis* on the western coast of Scotland is the *E. Drummondii* of Mr. Thompson, first discovered by Dr. Drummond in Belfast Lough. *Eolis alba*, hitherto considered a rare species, was not uncommon in the same localities. Some curious varieties occurred, especially one with the branchial papillæ of a brown colour and a few brown markings on the body, which, had we not found intermediate varieties, might almost have induced us to think it distinct. Some fine specimens of *Goniodoris castanea*, not the least interesting of our recent acquisitions, were procured at Saltcoats by Mr. David Landsborough, jun., to whose kind assistance we are also indebted for two of the new species of *Eolis* described below. Two specimens of *Doris flammea* and several of *D. Johnstoni* were found in Lamlash Bay.

Doris planata.—*Body* elliptical, much-depressed. *Cloak* extending much beyond the foot, thickly covered with obtuse warty tubercles, mostly minute, but of very unequal sizes, the largest ones being arranged at irregular intervals along each side of the back. Colour reddish brown, interspersed with dull lemon-yellow and purple-brown; the whole sprinkled with minute dark brown spots. A few irregular patches of dull yellow run down

each side. *Dorsal tentacles* stout, subclavate, yellowish, mottled with dark brown; laminae twelve or thirteen. *Branchiae* very small, retractile within a cavity; they consist of seven imperfectly bipinnate plumes pointed at the top and strongly blotched with opaque yellowish white and dark brown. *Head* indistinct, with long linear oral tentacles. *Foot* deep lemon-coloured, grooved and rounded in front, with the upper lamina notched in the centre. Length nearly an inch.

We found one specimen of this new *Doris* inside an old shell of *Pecten opercularis* dredged in Lamlash Bay. It is very unlike any of the other British species.

Doris sparsa.—*Body* ovate, much-depressed. *Cloak* of an obscure pale yellow, with a few reddish brown freckles and distant spiculose tubercles. *Dorsal tentacles* slightly conical, with eight or nine broad distant laminae, blotched with olive-brown; the margins of the cavities furnished with three or four tubercular points. *Branchiae* very small, colourless, consisting of nine pinnate plumes arranged in the shape of a horse-shoe. *Head* with a large semi-circular veil. *Foot* nearly as broad as the cloak, colourless; the front slightly bilobed. Length half an inch.

Found on *Cellepora pumicosa* from deep water, Cullercoats. It is allied to *D. depressa* and *D. pusilla*.

Eumenis flarida.—*Body* quadrilateral, pale lemon-yellow above, white beneath. *Dorsal tentacles* clavate and laminated; the sheaths set round the top with about six tubercles, the outside ones largest, each having a ring of fawn-colour. *Veil* very small, with about four tubercular points. *Branchiae* papillose, mostly short, set in a waved line on the sides of the back, three on each side being larger than the rest and nearly linear; they are all ringed with fawn-colour. The branchiae approach very near to the tail. Sides of the body with a few pale yellow markings. *Foot* nearly linear, transparent white, slightly tinged with purple brown at the margin; it is slit along the front and produced into tentacular points at the sides. Length about a quarter of an inch.

Dredged on a small coralline in Lamlash Bay.

Eolis Glotensis.—*Body* pale greenish-yellow. *Dorsal tentacles* of the same colour as the body, rather long, linear, smooth and thickened towards the top. *Oral tentacles* about two-thirds the length of the dorsal pair, and of a similar form and colour, set on the upper side of the lips: outline of the head semicircular. *Branchiae* rather short and thick; their central vessel of a dark bottle-green, approaching to black, the apices deep orange-yellow. They are set in eight or nine transverse rows, three to five in each row; the first three rows are close together. *Foot* transparent white, the front notched in the middle and the angles slightly produced and rounded. Length four-tenths of an inch.

Dredged in Lamlash Bay upon *Pecten opercularis*.

Eolis lineata.—*Body* slender, transparent white, with three opaque white lines running from head to tail; viz. one on the back bifurcating into the oral tentacles, and one on each side of the body below the papillæ. *Dorsal tentacles* rather long, linear, transparent white, with an opaque white line down the back of each. *Oral tentacles* about the same length as the dorsal ones, linear, and swelling a little at the base. *Branchiæ* rose-coloured, with a line of opaque white in front of each, terminating in a ring at the top. They are nearly linear, tapering a little above, and set in about four ill-defined clusters on each side of the back; the first clusters contain twelve to fourteen papillæ each, the rest fewer. *Foot* slender, with the front angles produced into short tentacular processes. Length upwards of a quarter of an inch.

Discovered by Mr. D. Landsborough, jun., among the rocks at Saltcoats, Ayrshire.

Eolis Landsbergii.—*Body* very slender, of a beautiful violet or amethyst colour. *Dorsal tentacles* slender, linear, violet tipped with white. *Oral tentacles* a little longer than the dorsal pair, and of the same colour. *Branchiæ* orange-red, the sheaths violet, with a ring of white at the apices; elliptical, short and rather stout, arranged in five or six clumps; the first containing eight to twelve papillæ, the second six to nine, the others not so many. *Foot* very narrow, finely pointed behind, arched in front, and with the lateral angles not much produced. Length rather more than a quarter of an inch.

Also found by Mr. D. Landsborough at Saltcoats.

EXPLANATION OF PLATE IV.

Figs. 1, 2, 3. Different views of the *Limapontia* taken at Torbay.

Fig. 4. Enlarged view of the anus.

Fig. 5. Enlarged view of branchia.

Fig. 6. A portion of the gizzard exhibiting the teeth.

Fig. 7. Auditory capsule and otoliths.

XXX.—*Notices in connexion with the Natural History of and its vicinity.* By Captain PORTLOCK, Royal Engineers, F.R.S.*

AN insular position must in most cases render it difficult to determine the fauna or the flora of a country in respect to their actual limits, and especially the fauna, as the slightest variation in the periodical directions of the currents, whether aerial or marine, may lead to the appearance of new objects both of the vegetable and animal kingdoms.

In the 12th volume of 'Annals of Natural History' is printed a valuable paper by Capt. Drummond, 42nd R.H. regiment, with

* Read at the Meeting of the British Association, Sept. 14th, 1844.

Notes by Mr. Strickland, on the Birds of Corfu, a paper originally read before the Zoological Section at Cork. In that paper, which contains the result of the labours of a gentleman at once an able naturalist and an active sportsman, continued for a considerable time, the following summary is given :—

	Species
Common to Ionian Islands and Britain	157
Doubtful if same as British species	3
European, but not British	30
Peculiar to Ionian Islands	1

Total number of birds of the Ionian Islands... 200

From Capt. Drummond I have lately received a memorandum containing some important additions and a few corrections of his list. The additions are—

1. *Turdus pilaris*. British.
2. *T. iliacus*. Ditto.
3. *Motacilla cinereo-capilla* } of Bonaparte's 'Fauna Italica.'
4. *M. melano-cephala* }

These birds were confounded with *Motacilla flava* in the Corfu list : the first is stated to be common in Italy, and the second to be found in Dalmatia, in Egypt and on the Caucasus, but to be rare in Italy.

5. *Emberiza cia*.

6. *Picus leuconotus*, confounded with *P. major*.

7. *Numenius tenuirostris*. Temminck gives Egypt as the country of this bird, but states it to be sometimes common on its passage in the southern parts of Italy, to be found near Rome, Venice and Pisa, and he adds that it is said to visit also Dalmatia and Greece. This latter statement is therefore now confirmed by Capt. Drummond.

8. *Ardea egretoides*. This connects it with the Sicilian and Turkish localities recorded by Temminck.

9. *Corvus collaris* (Drummond). A new species distinguished from the common jackdaw by having a large crescented patch of pure white on each side of the neck. The ringed jackdaw was found by Capt. Drummond at Sajdi in Albania, and he expects that it will be found in Corfu.

The corrections are—*Alauda brachydactyla* instead of *A. isabellina* ; *Sylvia leucopogon* instead of *S. conspicillata* ; and the summary therefore will be, as stated by Capt. Drummond,—

	Species
Common to Ionian Islands and Great Britain	159
Doubtful if same as British species.....	2
First stated as doubtful ; but as two species are said to have been confounded with it, I presume that the British species is sup- posed also to exist, viz. <i>Motacilla flava</i>	1
European, but not British	45
Peculiar to Ionian Islands	
New species established by Capt. Drummond, and as yet only found in Albania	1

Total number 209

The additions I have now to record on my own part are of a more

inglorious kind, as they have not resulted from the exertions of my own arm or the shots of my own gun, but in great measure have quietly dropped in to the lure of a silver whistle. Had Capt. Drummond confined his list to Corfu alone, I should have hesitated to record them, as the exact localities might be doubtful; but as it takes in the coast of Albania, the birds I have now to mention can without hesitation be added to it, as they were certainly all killed either on the island or on the opposite Albanian coast.

1. *Falco naevius*. In the plumage of an immature bird or as *F. maculatus*, the Spotted Eagle. Killed by my friend Dr. Mountain, R.A., at Butrinto, in December 1845, and presented to me. Temminck mentions it as inhabiting the woody and mountainous regions of Germany, as being very rare in France, more abundant in Russia and the eastern parts of Europe, and common in the south, as also in Africa, especially Egypt. Several of the gentlemen of the country say that they have seen the mature bird.

2. *Merops Savignii* (Vieill.). This beautiful and well-marked species, the *Meropa Egiziano* of Bonap., is stated to be abundant in Persia, Egypt, Tripoli, and as far as Senegal. The species was founded on specimens obtained at Genoa; another specimen was procured by Sig. Gangadi, and it is thus fairly incorporated amongst the birds of Corfu.

3. *Himantopus nigricollis*. From the marked character of one of the specimens before me, I am obliged to class it with the American species; and I shall state therefore my reasons for so doing, and then point out the peculiarities of a second specimen, which lead me to think that the natural history of these birds is yet imperfect.

Wilson says, "back, rump and tail-coverts also white, but so concealed by the scapulars as to appear black;" and such is the case: again, "line before the eye, auriculars, *back part of the neck*, scapulars and whole wings deep black, richly glossed with green;" and "in some the white from the breast extends quite round the neck, separating the *black of the hind neck* from that of the body." Now in these remarkable and striking particulars my bird is identical with that of Wilson.

Wilson says, tail "of a dingy white," whereas in my specimens the shade is beyond a dingy white, and approaches to a light slaty tinge; this however neither removes it further from the European species, in which the tail is also more or less white or ashy, nor approximates it to it. In my second specimen, which is probably a female, a young bird, the plumage is not so deep a black, but rather approaching to brown; and the neck, instead of exhibiting the complete black or brown-black, is blotched with those hues, showing distinctly an approach to the definite marking, but proving either immaturity of plumage or a state of seasonal change.

I cannot find any record of such changes, and as Wilson states the arrival of the birds to be in April, and their departure in September, it is evident he describes the summer plumage. By Yarrell one is recorded as seen by Mr. Ball at Youghall in the winter of 1823; but the greater number of specimens described by him appear to have been procured in summer, so that the plumage as described must be

also that of the summer bird. The winter plumage of the American species has yet to be determined; and from the appearance of change in my specimen, may it not prove that the two species are at this season closely approximated to each other? First specimen obtained April 9, 1846, the second a few days afterwards.

4. *Limosa melanura* (B.). In his Supplement Temminck states this bird to occur at Japan; its range is therefore very wide both to the north and south.

5. *Ardea comata* (B.). It is surprising that this beautiful species should not have occurred before in the island.

6. *Sterna Boysii* (B.), Sandwich Tern. As this has been recorded as an African bird, its appearance here only adds to its already very wide range.

7. *S. leucoptera*. As this bird is recorded by Temminck in his Supplement as common in Dalmatia, its appearance here is natural.

8. *Fuligula rufina* (B.), the Red-crested Pochard. As this species is already recorded amongst the birds of Italy, its appearance at Corfu was to be expected.

Incorporating therefore these birds into Capt. Drummond's list, the summary may be thus stated:—

	Species
Birds common to Ionian Islands and Great Britain	163
Doubtful if same as British species	2
Presumed to be British, though at first confounded with other species, and therefore rendered doubtful	1
European, but not British	48
Peculiar to Ionian Islands	1
New species founded by Capt. Drummond, and as yet only found in Albania	1
American species now first recorded as European	1

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In respect to the dates, as some were probably several days in the stuffer's hands before he brought them to me, whilst others were brought fresh, I may observe generally, that where the date is not given, it is to be understood that they were all obtained in the spring of the present year, prior to the month of May.

XXXI.—Descriptions of some newly discovered species of Araneidea. By JOHN BLACKWALL, F.L.S.

Tribe OCTONOCULINA.

Family THOMISIDÆ.

Genus THOMISUS, Walck.

1. *Thomisus incertus*.

Length of the male $\frac{1}{4}$ th of an inch; length of the cephalo-thorax $\frac{1}{4}$; breadth $\frac{1}{8}$; breadth of the abdomen $\frac{1}{8}$; length of a leg of the first pair $\frac{1}{2}$; length of a leg of the third pair $\frac{1}{4}$.

Eyes disposed on the anterior part of the cephalo-thorax in

two transverse, curved rows, forming a crescent whose convex side is in front; the lateral eyes, which are seated on a protuberance, are much larger than the intermediate ones, those of the anterior row being the largest of the eight. Cephalo-thorax convex, compressed before, truncated in front, abruptly sloping behind, without any indentation in the medial line; it is of a red-brown colour along the middle, with a broad brownish black band on each side comprising several irregular red-brown marks. Mandibles short, strong, subconical, vertical, dark brown tinged with red. Maxillæ convex near the base, enlarged where the palpi are inserted, pointed at the extremity, and inclined towards the lip, which is triangular: these parts are red-brown, the base of the lip being much the darkest. Sternum heart-shaped, with three dark brown spots on each side, and a streak of the same hue extending from its posterior extremity to the middle. Legs provided with hairs and sessile spines; the femora of the anterior pair are black, obscurely tinged with red on the sides and under part; the rest of these limbs is pale reddish brown, with the exception of a few dark spots on the sides of the genual joint and the base of the tibia; the second pair of legs resembles the first, except that the base of the femora is pale reddish brown; the third and fourth pairs are pale reddish brown with a few annuli of brownish black. First and second pairs of legs equal in length, the latter extending a little wider in consequence of being articulated to a broader part of the cephalo-thorax; third pair rather shorter than the fourth. Each tarsus is terminated by two curved, pectinated claws. Palpi short; the humeral joint is brownish black, palest at the base; the cubital and radial joints are reddish brown, obscurely marked with dark brown; the latter projects a long, brownish black, curved apophysis, which is recurved at the point, from its anterior extremity, on the outer side, and a reddish brown, crescent-shaped one on the under side; the digital joint is oval, dark brown, convex and hairy externally, concave within, comprising the palpal organs, which are highly developed, complicated in structure, with a black spine curved round their extremity, and are of a reddish brown colour. Abdomen depressed, corrugated, particularly on the sides, thinly covered with short strong hairs, broader at the posterior than at the anterior extremity, the latter, which appears as if cut in a straight line across, projecting over the base of the cephalo-thorax; its colour is dark brown, obscurely tinged with reddish brown; the sides are mottled with yellowish white, and the plates of the spiracles are dark reddish brown; on the upper part are five circular depressions; the three anterior ones are disposed in a triangle whose vertex is directed forwards, and the other two are situated parallel to its base.

My son, John Blackwall, discovered this spider in an outbuilding at Oakland in June 1845.

2. *Thomisus pallidus*.

Length of the female $\frac{1}{8}$ ths of an inch ; length of the cephalo-thorax $\frac{1}{10}$; breadth $\frac{1}{11}$; breadth of the abdomen $\frac{1}{7}$; length of a leg of the second pair $\frac{1}{4}$; length of a leg of the third pair $\frac{3}{10}$.

Mandibles short, strong, subconical, vertical, furnished with some erect bristles in front, towards the inner side : maxillæ slender, convex near the base, pointed at the extremity, and inclined towards the lip, which is triangular : sternum heart-shaped : legs provided with short hairs and strong spines ; the first and second pairs are very decidedly longer and more robust than the third and fourth pairs, the second pair being rather the longest and the third pair the shortest : palpi short, provided with hairs and spines : these parts are of a pale yellowish brown colour, the lip being somewhat the darkest. Each tarsus is terminated by two curved, pectinated claws, and the palpi have a small, curved, pectinated claw at their extremity. Cephalo-thorax convex, compressed before, broadly rounded in front, depressed on the sides and at the posterior extremity, without any indentation in the medial line ; there is a row of strong bristles directed forwards on the frontal margin, and its colour is yellowish brown, palest on the lateral margins, with an obscure, longitudinal, reddish brown band directed backwards from each lateral pair of eyes. Eyes disposed on the anterior part of the cephalo-thorax in two curved rows, forming a crescent whose convex side is in front ; the lateral eyes, which are seated on a protuberance, are much larger than the intermediate ones, those of the anterior row being the largest of the eight. Abdomen depressed, corrugated, much broader at the posterior than at the anterior extremity, the latter, which appears as if cut in a straight line across, projecting over the base of the cephalo-thorax ; it is sparingly supplied with short strong hairs, and is of a pale yellowish brown colour ; on the upper part are five conspicuous circular depressions ; the three anterior ones form a triangle whose vertex is directed forwards, and the other two are situated parallel to its base. Sexual organs red-brown. Plates of the spiracles pale yellow.

Found among grass in a pasture at Oakland in September 1845.

This species, like *Thomisus cristatus*, *Thomisus bifasciatus*, and some others, has the power of changing the colour of the anterior intermediate pair of eyes from dark red-brown to pale golden yellow by a very perceptible internal motion. No such

motion appears to occur in the other eyes, which are always black.

8. *Thomisus trux*.

Length of the male $\frac{1}{4}$ th of an inch; length of the cephalo-thorax $\frac{1}{8}$; breadth $\frac{1}{4}$; breadth of the abdomen $\frac{1}{4}$; length of a leg of the second pair $\frac{1}{2}$; length of a leg of the third pair $\frac{1}{4}$.

Mandibles short, strong, subconical, vertical, of a dark brown colour with a red-brown spot in front. Maxillæ convex near the base, enlarged where the palpi are inserted, pointed at the extremity, and inclined towards the lip, which is triangular: these parts are brown. Sternum heart-shaped and yellowish brown. Legs robust, provided with hairs and spines; they are yellowish brown, with the exception of the femora, those of the first pair, the anterior half of those of the second pair, and the anterior extremity of those of the third and fourth pairs being brownish black faintly tinged with red; the first and second pairs are considerably longer than the third and fourth, the second pair being slightly the longest, and the third pair is the shortest of all. Each tarsus is terminated by two curved, pectinated claws. Palpi short; the humeral and digital joints are dark brown, the cubital joint is yellowish brown, and the radial reddish brown; the radial joint is much stronger than the cubital, and projects a slender, slightly curved, pointed apophysis from its outer side, which is very prominent, and an obtuse one on the under side, which has a process at its base, on the outer side; the digital joint is oval, convex and hairy externally, concave within, comprising the palpal organs; they are highly developed, complicated in structure, with a strong prominent point near the middle, a filiform spine curved from the outer side round the extremity and along the inner side, and are of a dark brown colour tinged with red. Cephalo-thorax convex, compressed before, truncated in front, abruptly sloping behind, with a very slight indentation in the medial line; the sides are black, comprising a longitudinal band of a clear red-brown colour, and a broad band of the latter hue extends along the middle. Eyes disposed on the anterior part of the cephalo-thorax, which is provided with a few strong black hairs directed forwards, in two transverse curved rows, forming a crescent whose convex side is in front; the lateral eyes, which are seated on a protuberance, are much larger than the intermediate ones, those of the anterior row being the largest of the eight. Abdomen depressed, corrugated, particularly on the sides, thinly covered with short strong hairs, broader at the posterior than at the anterior extremity, the latter, which appears as if cut in a straight line across, projecting over the base of the cephalo-thorax; it is yellowish brown above, encircled by a band of yellowish white; on each side of the medial

line is a broad, irregular, longitudinal band of a dark brown colour extending nearly to the spinners, immediately above which organs are several transverse yellowish white streaks; in the middle of the space comprised between the dark brown bands are two dark brown lines forming a very acute angle whose vertex is directed backwards, and in its anterior part are five circular yellowish brown depressions; three are disposed in a triangle whose vertex is directed forwards, and the other two are situated parallel to its base; the sides and under part are dark brown mottled with yellowish brown. Spinners and plates of the spiracles yellowish brown.

Captured in June 1846 among grass in a pasture at Oakland.

The males of several species of *Thomisi* so nearly resemble each other in size, general form and colour, that a careful inspection of the structure of their palpi and palpal organs is essential to their accurate discrimination.

Family LINYPHIIDÆ.

Genus LINYPHIA, Latr.

4. *Linyphia pulchella*.

Length of the male $\frac{1}{10}$ th of an inch; length of the cephalo-thorax $\frac{1}{8}$; breadth $\frac{1}{4}$; breadth of the abdomen $\frac{1}{8}$; length of an anterior leg $\frac{5}{4}$; length of a leg of the third pair $\frac{1}{2}$.

Cephalo-thorax oval, slightly compressed before, prominent in front where the eyes are seated, convex, glossy, with an indentation in the medial line of the posterior region; it is of a yellowish brown colour. Eyes disposed on black spots in two transverse rows; the four intermediate ones form a trapezoid whose anterior side is the shortest, the posterior pair being the largest, and the anterior pair the smallest of the eight; the eyes of each lateral pair are almost contiguous. Mandibles powerful, conical, armed with teeth on the inner surface, and inclined towards the sternum, which is broad and heart-shaped: maxillæ enlarged where the palpi are inserted; the exterior angle at their extremity is curvilinear, and they are inclined a little towards the lip, which is semicircular and prominent at the apex: these parts are reddish brown, the lip being the darkest. Legs moderately long, provided with hairs and slender spines; they are of a yellowish brown colour; first pair the longest, then the second, third pair the shortest. Each tarsus is terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base. Palpi yellowish brown; the cubital and radial joints are short, the latter being much the stronger; the digital joint is oval, with a lobe on the outer side; it is convex and hairy externally, concave within, comprising the palpal or-

gans, which are very highly developed, very complicated in structure, and of a red-brown colour. Abdomen glossy, sparingly supplied with hairs, oviform, convex above, projecting over the base of the cephalo-thorax; upper part yellowish white, with a series of obscure, dark, angular lines, whose vertices are directed forward, extending along the middle, but least conspicuous on its anterior half; sides and under part pale yellowish brown. The plates of the spiracles are dark yellowish brown, and the transverse fold between them is prominent.

A male of this species was discovered among the grass of a pasture at Oakland in September 1845.

Family THERIDIIDÆ.

Genus THERIDION, Walck.

5. *Theridion versutum*.

Length of the male $\frac{1}{8}$ ths of an inch; length of the cephalo-thorax $\frac{1}{9}$; breadth $\frac{1}{11}$; breadth of the abdomen $\frac{1}{10}$; length of an anterior leg $\frac{2}{3}$; length of a leg of the third pair $\frac{2}{5}$.

Cephalo-thorax oval, slightly compressed before, convex, glossy, having an indentation in the medial line: mandibles powerful, conical, vertical: both parts are brown faintly tinged with red. Maxillæ convex at the base, pointed at the extremity, and greatly inclined towards the lip, which is semicircular: sternum heart-shaped: these parts are brown tinged with yellow, the extremities of the maxillæ being yellowish white. Legs long and slender; they are provided with hairs and are of a pale yellowish brown colour; first pair the longest, then the fourth, third pair the shortest. Each tarsus is terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base. The four intermediate eyes form a square, the two anterior ones, which are the darkest and rather the smallest of the eight, being placed on a prominence; the other four are disposed in pairs on the sides of the square, the eyes constituting each pair being contiguous and seated on a tubercle. Palpi pale yellowish brown; the radial is larger than the cubital joint and elongated on the outer side; this elongation is rounded at the extremity and applies very closely to the digital joint, which is oval, convex and hairy externally, concave within, comprising the palpal organs; they are moderately developed, complicated in structure, with a prominent process on the inner side, and a strong curved spine at the extremity, whose slender point is in contact with a delicate white membrane; their colour is reddish brown. Abdomen oviform, thinly covered with hairs, convex above, projecting over the base of the cephalo-thorax; the upper part is black with a large, white, crescent-shaped mark at

its anterior extremity, and three longitudinal rows of white spots, one on each side and the other extending along the middle, which diminish in size as they approach the spinners; the under part is yellowish white freckled with black, and the plates of the spiracles are pale yellow.

The spider described above was captured in the neighbourhood of Winchester in July 1846 by James Franklin Preston, Esq., of Plas Madoc, near Llanrwst, Denbighshire; and was comprised among specimens of *Araneidea* which that gentleman was so obliging as to collect for me in Hampshire and the Isle of Wight.

XXXII.—*The Birds of Calcutta, collected and described by*
CARL J. SUNDEVALL*.

[Continued from p. 261.]

32. *Gracula tristis*, Lath., Cuv.—*Pastor tristis*, Temm., Wagl. Rufo-grisea, capite lævi colloque nigris; ventre postico cum crisso, apicibus rectricum basique remigum late albis.

♂ ♀ similes. Sturno paullo major; ala 142 mill., tarsus 38, cauda 92; rostrum ab angulo oris 30. Lingua apice bifida, non lacera. Iris obscure rubra, circulo albo-punctato, circa pupillam. Vitta lata nuda, lutea e rostro per oculos. Rostrum et pedes tota lutea. Plumæ capitis longæ, acutæ, paullo erectiles. Alæ et cauda nigra. Alarum tectrices primariæ totæ, remiges posteriores longe ultra medium, albæ †. (Testiculi mense Martii parvi.)

This is one of the most numerous birds about Calcutta, and is stationary there. They live in great noisy crowds, which however do not form regular close flocks, but are continually assembled and dispersed or interchanged with others. In their mode of life they resemble both starlings and jackdaws; indeed they are quite like the latter when they walk upon the ground, nodding their heads at every step. The nests are always seen near grazing cattle. The flight is heavy, with a strong motion of the wings; but when they wish to stop, the wings are held still and expanded. The male is often seen to raise its tuft. In the morning and evening they sit in flocks on the trees, and make a fearful noise with their chattering voices, which sound like *tjati, tjati*, or *tjo-i*. No song was ever heard from them. They are not shy, and often come into the town. They eat chiefly rice, but often

* Translated from the 'Physiographiska Sällskapets Tidskrift' by H. E. Strickland, M.A.

† *Gracula fusca* e Java (*Pastor fuscus*, Wagl.) differt colore corporis obscure fusco; ala minus alba; vitta capitis nuda paullo minore, cauda brevior (75 mill.), rostroque paullo majore. De cæteris similis etiam dimensione.

insects, especially crickets. They will by no means live on meat. The Bengal name is *Salik* (the *i* short and accented). Their propagation is unknown to me.

33. *Gracula cristatella*, Linn.—*Pastor cristatellus*, Wagl. Cinereo-fusca, fronte cristata; macula parva nuda pone oculos, rostro basi nigro, pedibusque luteis; remigibus basi, rectricibus apice, crissoque albis.

♂ crista densiore, tectricibus primariis totis albis. Ala 120 mill., tarsus 35, cauda 77.—♀ tectricibus primariis basi nigris; ala 115. tarsus 33, cauda 70. Priori angustior, rostro paullo longiore. Lingua prioris, sed apice paullulum lacera. Iris flavissima, lata. Plumæ capitis erectiles; antice antrorsum spectantes, rectæ, non reflexiles, longit. 10 millim. cristam compressam in basi rostri formantes. Margo carpi et tectrices inferiores cinereæ, in priori albæ. Abdomen fulvescenti albidum.

Occurs less abundantly than the preceding, and frequents trees more. I only found this species solitary, not in flocks, from February to May. The note was less chattering, and the males were heard to sing agreeably enough, most like our Magpie or Starling. The feathers of the head in the males are raised and depressed almost constantly. While walking, the head is carried less high than that of the former species. In the stomach were found seeds and remains of fruit. By the natives this species was called indifferently *Majna* and *Sallik*, which name however applies also to *Gracula tristis* and *religiosa*.

34. *Gracula rosea*, Cuv.; Nillson, Skand. Faun.; Gloger, Eur. p. 169.—*Pastor roseus*, Temm., Wagl.

Pallide rubicunda; capite lateribus vix nudo, collo pectoreque antico, alis caudaque totis nigris.

Adulta rosea et nigra; capitis plumæ longæ, curvatæ, lacerae, attenuatæ.

♀ juv. (e Ceylon, Dec.). Superne fuscescens, subtus albida, rubicundo tincta, crisso nigro-maculato. Partes nigrae impure coloratæ. Plumæ capitis mediocres, rotundatæ, appressæ. Alarum plumæ tenuæ griseo-marginatæ. Rostrum superne nigrum, subtus flavescens. Pedes pallide fuscescentes. Iris obscura. Long. 8½ poll.; ala 127 mill., cauda 72.

While sailing in the Indian sea, two young individuals came on board; one near the southern point of Ceylon, Dec. 14; the other alighted on the ship halfway between Ceylon and the north point of Sumatra, at least 100 geographic miles from each, and 80 or 90 miles from the Andaman isles. The wind had been north-west, so that it probably came from the Indian coast. Both these birds soon became so tame as to eat out of the hand, and we fed them abundantly on cockroaches (*Blatta germanica*) which swarmed during the voyage. In Bengal I never saw this

species, but I consider it certain that it is found there, as it makes its migrations on the scale above-mentioned, and is found in Ceylon, the Indian peninsula and Persia.

Obs. *Gracula religiosa*, Linn. (*Eulabes*, Cuv.) var. *minor*, was often seen in cages at Calcutta on sale for one or two rupees. It was said to be captured in the country, but I could not get any certain information that it is found wild in Bengal, and I soon learned that the assertions of the natives in such cases are not to be relied on. It is very possible that they come in the ships from Java. The Indian name is *Majna*, which in the English orthography is written *mino* or *myana*, by which name it is called in the oldest accounts of the species. Edwards writes it *Minor*, and the French have thence made the name *Mainate*. In Java the bird is called (according to Horsfield) *Beo* or *Mencho*.

35. *Sturnus contra*, Linn.—Pastor, Wagl.

Rostro elongato, recto, apice depresso. Niger, capitis lateribus, ventre, vitta alarum uropygioque albis. Vitta per oculos maxima, nuda flava*.

Longit. 8 poll. Ala 120 mill., tarsus 33, cauda 73, rostrum e fronte 25. Lingua bifido-laccra. Iris alba. Pedes flavi. Rostrum basi luteum, apice album. Nucha paullo albido- seu griseo-varia.

♀ non differt nisi colore paullo fusciore, juvenes et hiemales ventre sordido.

The Indian Starling is very common near Calcutta, where it is called *Kalickia*. I am not informed whence the name *contra*, which according to the older authors is its Indian name, is derived. In the form of the body, the actions, voice, &c. it has the nearest resemblance to our Starling. Like that bird, it is first seen in spring in small flocks, which late in March are broken up for pairing. It is chiefly found near houses, and lives principally on insects. In March it is also seen diligently plucking the flowers of the cotton-tree (*Bombax malabaricus*). It is a stationary species.

36. *Upupa epops*, Linn., was twice seen (once on April 20, near Serampore), but was not obtained. The flight, motions, and, as far as I could see, the colour also were identical with those of our northern Hoopoe. It is said not to be rare, according to the Danish merchant Berg, in Serampore, who in this bird recognised the Hoopoe of his own country, and said that he had heard its voice the same as in Denmark.

37. *Corvus splendens*, Vieill., Wagler.

Obscure griseus, capite supra, collo antico, alis caudaque nigris, violaceo-nitidis. Juguli plumis lanceolatis, virescenti-nitidis.

* *Pastor ialla*, Horsf., e Java, differt colore superne rufescente-nigro, et albedine capitis minore; sed non nuditate capitis ut dicit Wagl. (Syst. Av.). An dist. sp.?

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Z

Long. $16\frac{1}{2}$ poll. Ala 260 mill., tarsus 43, rostrum e fronte 44, altit. 18, cauda 178. Iris nigrofusca. Rostrum magnum, ut *Coracia*, sed compressius; dorso elevato, carinato, compresso, valde arcuato. Setæ narium vix ad medium rostri extensæ. Plumæ corporis basi albæ. Cauda leviter rotundata, alas longe superans. ♂ paullo major et nitidior quam ♀.

In most respects this species forms a connecting link between the Grey Crow and the Jackdaw. The colours resemble both: the form of the body, of the neck and head, are those of the Crow; the activity of the movements comes nearer those of the Jackdaw; but the beak is much larger and more compressed than in either, most like the Raven's.

Corvus splendens is very common about Calcutta during the whole year. Evening and morning it is seen in flocks, which roost at night in trees, commonly in company with *Gracula tristis*. They have their common abode on the road between Calcutta and Fort William, and make a terrible noise. The note is a short, guttural, but not rough, *grah, grah*, quite unlike that of our species. The usual food consists of various refuse, also fish, crabs, &c., which are left dry by the ebb-tide, but especially of the innumerable dead bodies which daily float in the river and are cast upon its banks. They share this booty with the Vultures and *Ciconia Argala*. When these more mighty rivals are present, the crow is often obliged to quit his place; but one may often see him, when driven off by some vulture, hop up with the true *naïveté* of a jackdaw on to the back of the mighty bird, and from this elevation look around for some other place where he can get a share in the feast undisturbed. One often sees a crow sailing by upon a corpse floating in the river, on which it is feeding voraciously. The nests are built of twigs in trees, both near the trunk and among the smaller branches. They are without roofs, and resemble those of the raven. In the month of March I saw a pair build in the mainmast of a dismantled ship. There were five eggs in the nest which I discovered in the beginning of May, in colour, spots, and size like those of the jackdaw (their mean length was 37 millim.), but they show rather greater mutual differences in form and intensity of colour, as is common among the crows. They appeared mostly to lay their eggs in April and May, but already on the 4th of April there was seen a nearly full-feathered young one which had just left the nest. The Bengal name is *Khaa* (both *a*'s pronounced separately). The Musselmans call it *Gawa* (the *w* as in English).

38. *Corvus enca*? Horsf., Wagler. Totus niger plumis basi cinereis; cauda subæquali, alas longe superante. Plumæ juguli mediæ lanceolatæ nitidæ, apice bifidæ. Rostrum maximum, compressum,

culmine elevato, arcuato. Macula parva nuda pone oculos, nulla sub eis.

♂ Long. 17 poll. Ala circa 270 mill., tarsus 51, cauda 170, ($\frac{1}{2}$ ultra alas); rostrum e fauce 59, altit. 23, cum cranio 98. Totus niger, dorso, scapulis tectricibusque violaceo-nitentibus. Rostrum fere *coracis*, sed magis compressum et longius extensum; forma exacte ut prioris; setæ narium non ad medium rostrum extensæ, culminis basin haud tegentes. Remex 2^a brevior quam 6^a, longior quam 7^a. Crederem hunc esse *C. encam* quæ autem a Wagler, quoad formas, cum *C. frugilego* comparatur; dimensiones etiam omnes *C. encæ* majores.

This species is less common than the last; I never saw it in flocks, but only solitary, or paired in spring. The note consists of a tolerably clear, rough *krah, krah*, which is much hoarser and shorter than in our crow, and more like the rook's voice. The food consists of insects; in the stomach were found only larvæ and butterflies. I never saw this species near corpses, which however are to be obtained everywhere. This is the species which the Europeans in Bengal call Raven. The Bengalese name is *Kaak* or *Dohm Kaak*.

39. *Hirundo rustica*, Linn.—Some individuals were seen March 23, near Sucsagor, some miles N. of Calcutta. I could easily have shot the first which offered, for it sat on a post at some yards distance, where I was once resting; but my surprise at meeting here with the Swallow, which in my own country I had cherished with especial affection from childhood, prevented the shot. I am however fully satisfied that this specimen was altogether like those which occur with us; the white spots on the tail, the white under-parts, red throat, surrounded with black, &c. were seen clearly and recognised instantly. I never saw this bird in other places.

Obs. Another species of Swallow with a slightly forked tail was also seen near Sucsagor, but not obtained. Probably several species are found in the country, as I thought I saw considerable variety among the Swallows which flew about, though they do not occur so commonly as the two following *Cypseli*.

II. GRESSORES.

40. *Cypselus affinis*, Gray, Illustr. of Ind. Zool. ii. t. 6. fig. 2.

Niger, gula uropygioque late albis; cauda brevi, æquali ♂ (e Ceylon Dec.). Loræ aterrimæ. Caput supra fuscescens, antice cinerascens, limite superciliari tenui, albido. Dorsum æneo-micans. Ala nigra, margine carpi cinerascens; remiges 1 et 2 æquales, caudam 40 millim. excedentes. Pennæ cubiti ad $\frac{1}{2}$ alæ exeunt. Rectrices 10 æquales. Longitudo ad ap. caudæ 4 $\frac{1}{2}$ poll. Ala 130 millim. Cauda 38.—♀ Similis mari, vix magis fusca.

Rostris, pedum et tectricum alarum structura omnino ut in *Cyps.*

apode. Tarsi plumati. Nares apertura lineari introrsum arcuata, et ad latus internum membranæ sita. (In *C. apode* apertura per medium membranæ ducta.)

The two specimens above-described came on board ship December 6th, in the midst of the Indian ocean, near the equator, due S. from Ceylon, consequently ninety geographical miles from that island, and the same distance from the Maldives. They seemed fatigued, and settled upon the rigging, from which they were shot down. The wind had been somewhat variable, with storms of rain, but not strong enough to drive these powerfully-flying birds astray. They must have been on some excursion without a definite object, which at all events had been their last; and doubtless innumerable multitudes of birds perish every year in the sea from a similar love of wandering. The same species was afterwards recognised in Bengal, where it appeared very common, though I did not obtain it there. A pair of these birds was seen in a house at Serampore, where they built in February and had young the beginning of April. The nest lay on a beam, about ten ells high; it was composed of feathers, straw, &c. without mud. I omitted to observe whether this nest was smeared with a glutinous substance like that with which the nest of our Swift is cemented together, for this last circumstance was then unknown to me. During flight this species resembled the House-Swallow rather than the Swift, since the wings are not so pointed and curved as those of the latter. These and other allied birds in India were seldom seen to fly in the middle of the day, but mostly in the morning and evening. The male above-described had many worms in the intestine.

41. *Cypselus palmarum*, Gray, Ill. ii. t. 6. fig. 1.—[Verisim. *Hirundo indica*, Gm., Lath. no. 16, et *Hir. ambrosiaca* var. *b*, Lath. no. 9.]

Griseus, subtus dilutior, cauda profunde furcata, alis parum brevior. Longit. fere 5 poll.

♂. ♀ (initio Maii). Immaculatus, supra fuscescens, capite vix rufoescente tincto. Gula et genæ albidæ. Remiges et rectrices paullo ænescentes. Rostrum et pedes nigri. Long. alæ plic. 112 millim., caudæ 65. Digni prioris. Remigum 1^a brevior quam 2^a, narium apertura sublinearis, ad latus externum membranæ. Tarsi extus tantum plumati. Rectrices mediæ duplo breviores quam extimæ.

The flight of this species also is much like that of the House-Swallow. The species is common in Bengal. In the beginning of May I saw a pair who were engaged in building their nest high up in a palm-tree (*Borassus flabelliformis*) among the lower portion of the leaf-stalks, which correspond to the branches in other trees. They had their mouths all alimy, and full of a kind of down like the pappus of some syngenesious plant, which they appeared to catch during flight; for I saw them fly round for a

while, and betake themselves at intervals to their destined habitation, but never once settle on the ground or even approach the plants. The nest itself was not visible, nor would it have been easy to ascend to it up a perfectly smooth stem fifteen or sixteen ells in height. Gray, in the work above-quoted, represents such a nest resting upon the leaf itself of a palm. In the stomach of this species were found small hard insects.

42. *Picus bengalensis*, L. et auct.—*P. nuchalis*, Wagl. Syst. no. 64.

Crista coccinea, dorso luteo, corpore nigro alboque longitudinaliter vario; alis antice nigricantibus, albo-maculatis; cauda nuchaque nigris immaculatis; pollice minuto; naribus nudis.

♂ capillitio toto rubro. ♀ fronte verticeque nigris, albo-guttatis (Febr.—Aprili). In ♀ adulta (Martio) plumæ dorsi anterioris apice rubro-auræ. Ala 144 millim., tars. 21. Iris obscure rubra. Rostrum longit. capitis, angulis obsoletis.

This handsome Woodpecker was the only one which occurred commonly near Calcutta. It has most affinity with our Green Woodpecker, the mode of flight is exactly the same, and the note is merely a little more shrill, as the bird is considerably smaller. It was named *khort-gutturie* by a Hindoo whom I made to pronounce the word very distinctly; other persons called it commonly *ghulghutti* or *kolkotti*. The Woodpeckers form the richest in species, the most uniform and the most widely extended group of all genera of birds. They are found in all the regions of the earth [except Australia] where trees grow, and they everywhere exhibit the same mode of life. The Pigeons are almost equally extended and numerous, but they show considerable diversities of form, which may justify the adoption of many distinct genera.

43. *Picus macei*, Vieill., Temm., Wagl. Syst. no. 26.

Supra nigro alboque fasciatus, subtus sordide albus lateribus pectoris nigro striolatis; crisso definite rubro; rectricibus nigris lateralibus fasciis integris albis. Rostrum longitudine cranii.

Capillitium: ♂ rubrum; ♀ nigrum. Longit. 7 poll. Ala 100 millim. (E subdiv. *Pici majoris*.)

This species has so much resemblance to our Little Woodpecker (*P. minor*) that one might easily regard it as a variety of the latter, which in a warmer climate has attained a somewhat purer and more definite coloration. I only saw the bird twice, in the month of March. The Bengalese name was said to be *ghot ghotta*, which in fact is merely a slightly different pronunciation of the fore-mentioned name, or a diminutive of it.

[To be continued.]

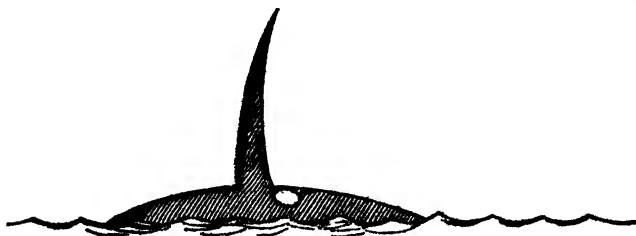
XXXIII.—*Additions to the Fauna of Ireland, including species new to that of Britain;—with Notes on rare species.* By WILLIAM THOMPSON, Esq., Pres. Nat. Hist. and Philos. Society of Belfast.

MAMMALIA.

High-finned Cachalot, *Physeter tursio*, Linn.

I AM happy to be enabled to join my friend Professor Bell (see British Mammalia, p. 512) in maintaining the existence of this species, which Cuvier, from the unsatisfactory nature of the data respecting it, believed to be fictitious :—even yet no proper description or figure has been published.

Professor Bell comes to his conclusion on information to which Cuvier had not access, and which was communicated to him by Mr. Barclay of Zetland. The occurrence of the species on the coast of Ireland was made known to me by Capt. Thomas Walker, who replied as follows to a letter requesting the fullest information on the subject :—“ Kilmore, Bridgetown, Wexford, July 28, 1846 :—As to the High-finned Cachalots, I saw them myself about seven years ago, and only know them to have been so from the descriptions in works of natural history which I consulted to find out what they were. There were either five or seven of them—I now forget which number—but I think the latter, and two of them were much larger than the rest, apparently about twenty-five feet long, from comparing them with the length of the boat in which I was. When first I saw one, I thought it was a cot [small flat-bottomed boat] at anchor with her tarred sail made up to the mast ; more then rose, and they crossed in a long file the bows of my boat so close, that I put about the boat (though of seven tons burthen) fearing they would upset her. When I put about, they were not more than three or four yards from me ; the back fin appeared about ten or twelve feet high, and had either before or behind it (I cannot now recollect which) a round white



Appearance of the High-finned Cachalot as seen by Capt. Walker.

spot on the back ; all the rest of the body that showed was black like a porpoise. I did not see the head or tail, nor more than a portion of the back : they went steadily, not rolling like a porpoise.”

There certainly is no proof here that the species noticed was a *Physeter*, but, that it was what has been called the High-finned

Cachalot does not in my opinion admit of doubt. In Templeton's 'Catalogue of the Vertebrate Animals of Ireland,' the *Physeter tursio* is noticed, but merely in the following words:—"Thrown ashore on the western coast occasionally."

BIRDS.

The White Wagtail, *Motacilla alba*, Linn., Gould; Yarrell, Brit. Birds, Supp. p. 22,

is included on the following testimony of Mr. R. Ball. In a letter to me dated Dublin, June 19, 1846, it was stated, that a few days before, when at Roundwood, he had seen a specimen of the true *Motacilla alba* as distinguished from *M. Yarrellii*. It was remarked:—"We watched it for some time, though at a short distance from us, with a small telescope used for such purposes; its beautiful plumage was very distinct from that of the common species, and its habit much more sedate than is usual with Wagtails: it 'wagged' but little, and walked about demurely.—I am quite sure that I have often seen the species before." As the bird was not actually obtained, its occurrence would not be inserted here without my having perfect reliance on the knowledge and acute observation of my informant.

Bonaparte's Sandpiper?

Schinz's Sandpiper, Eyton, Gould, Yarr.

Tringa Bonapartei, Schlegel, Rev. Crit. Oiseaux Eur. p. 89*.

Tringa Schinzii, Bonap.

is believed on circumstantial evidence to have been once obtained in Ireland.

In the Belfast museum there is a specimen of this bird, respecting which positive information cannot now be obtained, but it is considered to have been shot in the bay here from the circumstance of its having been preserved in a manner peculiar to a taxidermist who set up a fresh "sandpiper" (as it is called in his book) for the collection in the spring of 1836, which, all circumstances considered, was most probably this bird—he never set up any *Tringa* from dried skins. I have compared the specimen with the American one described and figured by Mr. Yarrell, and found it quite identical in species: this is the individual noticed in the second edition of this author's 'British Birds,' vol. iii. p. 74.

Only one of these birds, recorded by Mr. Eyton as killed in Shropshire, has been obtained in Great Britain. Its occurrence on the continent of Europe is not noticed in the latest works that I have seen (Temminck, part 4; Keyserling and Blasius; Schlegel). North America is its native country.

Purple Waterhen, *Porphyrio hyacinthinus*, Temm.

A communication from Richard Chute, Esq. of Blennerville, county

* This name is given to the species on account of Brehm having bestowed the same name on a different *Tringa*.

of Kerry—a gentleman who has contributed much to our knowledge of the birds of that part of Ireland—written on the 17th of March 1846, mentioned his having that day received for examination a stuffed specimen of a bird which in a fresh state had been blown in upon the coast near Brandon :—that it was of a species unknown as British, and not described in any work to which he had access. A detailed description of it was therefore sent that the writer might be informed of its species. The dimensions of the different parts, and the colour were so fully noted as to enable me at once to reply that the bird must be the *Porphyrion hyacinthinus*. When in London some time afterwards, I applied the description to a bird of this species in the British Museum, and found a perfect agreement.

It is unnecessary to repeat the dimensions of the bird, which was of full adult size, but the description of the plumage may be given as denoting its age :—the sex was not looked to in the preparation of the specimen. "Head, throat, neck, breast, all the under parts, the wing-feathers, and most of the wing-coverts are of a greenish purple, throwing out different shades in the sun; indeed, the wings and lower parts of the neck are more of a royal purple; the throat and about the eyes a greenish purple not unlike the colour of the tail of a Kingfisher, but brighter;—the back, shoulders, upper wing-coverts and tail are of a bottle-green; the under tail-coverts white. The parts of the feathers all over the bird that are not exposed are of a dark brown; the edges of the green feathers have a very slight tinge of purple. Bill, frontal plate and legs red."

This beautiful species inhabits the south of Europe and north of Africa: the most western locality noticed as inhabited by it in the works of Temminck (vol. ii. p. 699, and vol. iv. p. 443) and Schlegel (p. cii) is the island of Sardinia*. An isolated instance however of an individual being procured in a marsh in Dauphny is recorded in the 4th part of Temminck's work—published in 1840.

The bird obtained in Ireland was found about the first week of November 1845, lying dead in a ditch near the village of Brandon, which is on the sea-coast. It came under the inspection of Dr. Williams of Dingle in a recent state before being skinned for preservation. The specimen was given to Capt. Clifford, Inspector of the Coast Guard there, preserved and stuffed by one of the men under his command, and subsequently presented to Mr. Chute.

Fulmar Petrel, *Procellaria glacialis*, Linn.

Among ornithological notes made by the Rev. Joseph Stopford—a gentleman well-acquainted with our native birds—and communicated to Dr. Harvey of Cork (by whom I have been favoured with them) is one of a Fulmar having been shot at Inchidoney Island, on the southern coast, in 1832 by Capt. Hungerford. It was sent to the writer, by whom it was presented to Sir Charles Paget, then forming a collection of birds at Cove. In January 1846, Mr. T. W. Warren

* Information on the species is given in the 'Magazine of Zoology and Botany,' vol. ii. p. 353.

of Dublin kindly communicated to me a detailed description of a bird shot on the North Strand, Dublin Bay, on the 1st of that month, mentioning at the same time that it was a species which had never before come under his notice, nor that of Mr. Glennon, bird-preserve, through whose hands so many rare birds have passed within the last thirty years. The description marked it as a Fulmar in adult plumage, and on my calling Mr. R. Ball's attention to the circumstance, he saw the bird and confirmed the fact of its being so.

Note.—Belted Kingfisher, *Alcedo alcyon*, Linn.

When noticing in the 'Annals' for the month of December last (vol. xvi. p. 430*) that a specimen of this bird shot in the county of Meath had been sent to Dublin to be preserved, it was remarked that a second individual had about the same time been seen in the county of Wicklow. Although I had not a doubt that the bird observed in the latter locality was really of this species, it is desirable to embrace this opportunity of stating further that it was subsequently shot, and proved to be so. It is now in the collection of T. W. Warren, Esq. The first-killed bird was purchased for the museum of Trinity College, Dublin.

FISHES.

Black Sea Bream, *Cantharus lineatus*, Mont. (sp.). *Cantharus gri-seus*, Cuv. & Val.

To Dr. J. L. Drummond we are indebted for the addition of this species to our fauna. On the 18th of May 1846 he obtained a fine specimen, which was taken on a hand-line with lug-worm (*Arenicola piscatorum*, Lam.) as bait, on "foul ground" at Cultra Point, Belfast Bay. My friend drew up an ample description (zoological and anatomical) of the specimen, which he carefully preserved and kindly sent to me. I make the following selection from his notes:—

"Length from snout to middle of caudal fin 16 inches; breadth at shoulder $6\frac{1}{2}$ inches; weight 3 lbs.

"D. 10+11; P. 10 (the fifth longest); V. 1+5; A. 1+11; C. 17. Branch. 5.

"D.-fin, almost black in colour, rises from a deep groove in the back.

"Whole fish of a dark leaden hue; lateral line very conspicuous, black, broad, and of similar breadth throughout—less than one-third the depth of the fish from the back; upper lobe of C.-fin longer than the lower; eyes large, yellowish, irides dark brown; scales large, firmly imbedded in the skin, transparent: the colour of the black lines is in the skin itself and is seen through the transparent scale.

"Cæca wide, about $1\frac{1}{4}$ inch long, their walls very thin, as were those of the stomach: both nearly transparent; swimming-bladder large and silvery.

"Intestine except at lower end very thin, rather long, very wide,

* See additional note in the January Number (vol. xvii. p. 69).

and containing large masses of vegetable matter, which in the microscope seemed to be chiefly *Ceramium rubrum* and *Rhodomela subfusca* deprived of their parenchyma, but their walls remaining entire and transparent. In the lower part of the intestine was the operculum apparently of a whelk (*Buccinum undatum*), with the firm muscular white part of the animal firmly attached to it and unaffected by the digestive process, showing probably that vegetable food is that natural to the fish. The specimen was a male, the milt very solid; presenting no appearance of spermatozoa when broken down and magnified."

Mr. Couch says of this species that—"it takes the common baits which fishermen employ for other fish, but feeds much on marine vegetables, upon which it becomes exceedingly fat," Yarr. B. F. vol. i. p. 131. This single specimen, as will be seen from the preceding notes, attests the correctness of the remarks respecting both bait and food.

All the British localities for this species named in the work just cited are on the extreme southern line of the English coast.

Sword-fish, *Xiphias gladius*, Linn.?

Mr. R. Ball has supplied me with an extract from a book in which donations to the museum of Trinity College, Dublin, were entered. It announces the receipt of the "Sword-bone of the *Monoceros* or Sword-fish, together with the socket of the eye and remains of an animal taken out of its maw. This fish was taken in a net on the coast of Wexford, but is very seldom known to visit that coast. Presented by Mr. Carey (Carew?), 1786?"

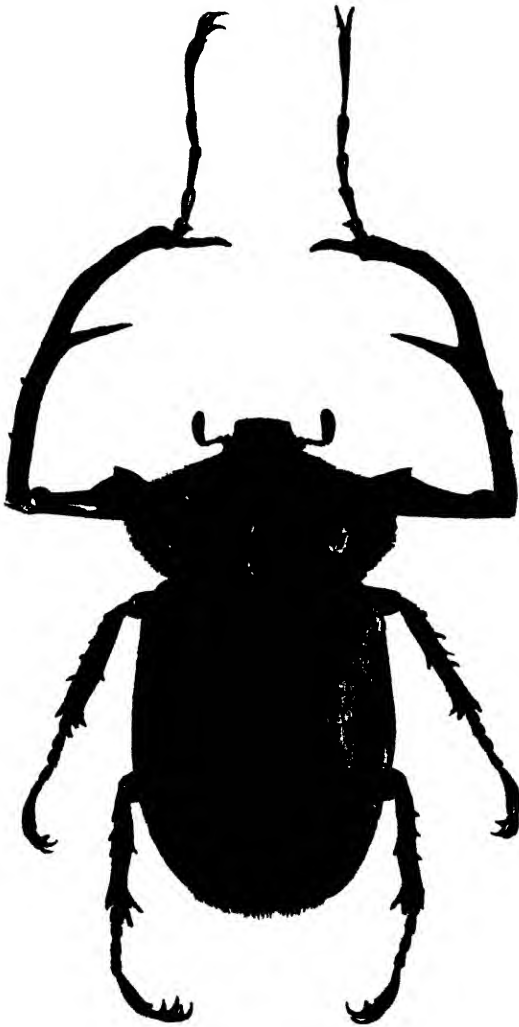
Mr. Ball is of opinion that this note applies to the weapon, &c. of a *Xiphias* in the museum, and not to the Sea Unicorn, *Monodon monoceros*, Linn., which might also possibly occur on the Irish coast. I have been told, but not with sufficient certainty to announce it, of the occurrence of the *Xiphias* upon another occasion on the southern coast.

Remora, *Echeneis remora*, Linn.

A letter from Mr. R. Ball, dated Dublin, July 29, 1846, informed me that Mr. N. A. Nicholson had that morning brought him a fresh specimen of this fish, which he found adhering to the gills of a large shark, which with the aid of a fisherman he captured at Clontarf, Dublin Bay, on the preceding night: it was observed in shallow water and driven ashore. A second *Remora* was adherent to the gills at the opposite side, but when disturbed, it made its way inwards by the branchial orifices, and was not seen again. Mr. Ball afterwards saw the fish on which the *Remora* was found; it was a Blue Shark (*Carcharias glaucus*) of a beautifully blue colour, and 10 feet 1 inch in length.

Lancelet, *Amphioxus lanceolatus*, Pallas (sp.); Yarr. Brit. Fishes.

Three specimens of this extraordinary fish with which I have been favoured, were dredged on sand from a depth of forty-five fathoms off



Cape Clear, in the month of May last, by Mr. MacAndrew, whose successful dredging exploits are so well known. This gentleman, writing from Liverpool in August 1846, gave me the following interesting particulars of the Lancelet:—"The first time I obtained this species was early in Sept. 1843 in Kilbrannan Sound, West Clyde—forty to fifty fathoms; muddy sand: the specimens were of large size, about double that described by Yarrell, and appeared to possess some peculiarities*—one was placed in the hands of Mr. Goodsir, and the other deposited in the museum of the Royal Institution, Liverpool. At the end of April 1845 specimens were procured off Mount's Bay, Cornwall, in about thirty fathoms; and west of Scilly, forty-five fathoms in clean sand. It is by no means rare on the Cornish coast, as on two or three occasions I found as many as five in my dredge at once."

Note.—Mackerel Midge, *Motella glauca*, Couch (sp.).

A specimen of this minute fish was on the 22nd June 1844 taken in company with a few others of allied species at the Kyles of Bute, on the western coast of Scotland, by Mr. Hyndman:—they were at the surface of the water.

[To be continued.]

XXXIV.—*Brief description of the male of Cheirotonus MacLeaii, Hope.* By F. J. S. PARRY, Esq., F.L.S. &c.

[With a Plate.]

EUCHEIRIDÆ.

CHEIROTONUS MACLEAII (Hope) ♂. Plate III.

Æneo-viridis, thorace lateribus externe serrulatis, varioloseque punctatis; sulco longitudinali in medio dorsi fortiter impresso; elytris fusco-æneis, maculis croceis, marginibus elevatis, corpore infra croceis pilis tecto.

Pedes antici, longissimi, coxis armatis, femoribus elongatis, sinuatis, in medio dente singulo armatis, quatuor postici, femoribus subcompressis, muticis, tibiis basi multispinosis.

Long. unc. $2\frac{1}{2}$; lat. unc. $1\frac{1}{2}$.

The above is a short description of this singular and rare insect, I believe the only one yet seen in Europe; it was received by Henry George Harrington, Esq., from the northern parts of the Himalaya range, and to that gentleman I am indebted for its possession, as also for the accompanying Plate, so faithfully executed by Mr. Wm. Wing. There is little doubt that it is the male of *Cheirotonus MacLeaii* described and figured by the Rev. T. Hope in vol. xviii. of the 'Linn. Transactions.'

* I have since learned that these were not of specific value.—W. T.

XXXV.—On the Development of the Chelonians.

By H. RATHKE*.

I HAVE for nine years been engaged in collecting materials for a history of the development of the Chelonians, and I think of soon publishing the result of my researches. I have had an opportunity of examining the embryo in a considerable number of fresh eggs of *Emys europæa*, from its first appearance to the period when the toes of the feet would soon have appeared. For the knowledge of the succeeding periods of development, I had at my disposal two almost mature embryos of *Chelonia* and *Testudo* and ten very young Chelonians of different species (*Chelonia Mydas*, *Sphargis coriacea*, *Trionyx gangeticus*, *Tr. ocellatus*, *Emys europæa*, *Em. mauritanica*, *Cinosternum scorpioides*, *Cin. pensylvanicum*, *Platemys Spixii*, *Pentonyx* . . .).

The development of the embryos remains some time quite in accordance with the general type of the development of the most perfect vertebrated animal. It is especially the respective position of the ventral and dorsal laminæ and of the spinal marrow which does not differ in the least, either at the commencement or at a later period, from what we observe in the higher vertebrated animals. The remark of M. de Baër, "that, in the young embryos of *Emys europæa*, the ventral laminæ are attached to the dorsal laminæ, at the point where the latter are united above to close the dorsal furrow, and that the back itself is thus somewhat depressed," is a very pardonable error, as the embryo is attached very strongly to the yolk, which is very tenacious in that species. Nor can the assumption of my scientific friend be proved, "that, in the Chelonians, the extremities are not detached from the upper (or external) surface of the ventral and dorsal laminæ, as in the other vertebrated animals, but from their lower (or internal) surface." I have found, on the contrary, in the youngest embryos of *Emys europæa*, the extremities situated externally, in the same parts of the body, and in the same manner as in the embryos of the mammals, birds and Saurians.

The embryos of *Emys europæa*, the extremities of which are so developed that the digits must soon have appeared, but the ribs of which were not yet visible, resemble excessively the very young embryos of the Saurians and mammals. Their body in particular is neither flattened above or below, nor too wide for its length, and its dorsal part is insensibly continued (without interruption, without elongated margin, as in the adult Chelonians) with the neck, with the lateral parts and with the tail. Starting from the examination of these young embryos and from the observations

* Translated from the *Annales des Sciences Naturelles* for March 1846.

made in other Chelonians which were not entirely developed, I shall endeavour to give a sketch of the manner in which the development of the Chelonians takes place in general.

After a somewhat advanced development of the extremities in the embryos, the dorsal and ventral surfaces of the body are gradually flattened, more or less, according to the different species, and two lateral apophyses begin to shoot from all the twelve or thirteen vertebræ of the trunk. Most of these apophyses, being developed like the eight intermediate pairs of ribs, acquire in a short time a very considerable length. As they are in general but slightly curved, their extremities are turned more outwards than downwards. Thus, by the very rapid and considerable elongation of these ribs, the sides of the body, containing their extremities turned outward, are pushed much forward on each side, and the trunk becomes very wide between the anterior and posterior feet, situated at its commencement and termination.

It is a fact as singular as characteristic of the Chelonians, that their last two ribs, remarkable for their longitudinal growth, that is to say, in general the eighth and ninth pairs, are turned directly backward, whereas the second pair (but not in all the Chelonians) have a somewhat anterior direction. The chorion then forms a fold on each side, at the spot where the extremities of the very prolonged ribs (second or eighth pair) are situated. This fold stretching out, projects anteriorly beyond the anterior foot to reach the neck, and posteriorly beyond the hindermost foot to reach the tail; lastly, it meets, on the neck and on the root of the tail, the similar fold of the opposite side, and the two unite to form a single circular fold, which then separates the back of the sides of the body. In some Chelonians, especially the marine, this fold expands slightly during the development; in others, principally in the *Trionyx*, it becomes extremely broad, especially the part situated above the tail. Much later, that is to say after the hatching of the embryos, the ribs, before remarkable for their length, but up to that time, all or nearly all of a cylindrical form, become also much wider. This increase in width begins from the spot where the neck unites with the body, and advances thence more or less toward the extremities; it becomes so considerable, that the bodies on all the ribs, from the complete absence of intercostal muscles, are on each side in contact and adhere, either perfectly, that is to say in their whole length, as in the genera *Emys*, *Terapene*, *Testudo*, *Trionyx*, or almost perfectly, that is to say for the greater part of their length, as in the *Chelonia*. The intercostal nerves and some vessels situated at first between the ribs, then pass beneath them. In return, the first and the last rib become much shorter than the others, and always continue very narrow and thin. Their relations also

with the neighbouring ribs differ much from those of the intermediate ribs; for, as the latter increase greatly in width, the second exceeds the first, and the last but one surpasses the last so much that it covers it more or less entirely. Soon after the eight pairs of intermediate ribs have begun to widen, a branch protrudes superiorly from each rib, near the vertebral column. This branch continually increasing passes beyond the rare and thin dorsal muscles; the two sacro-spinal muscles (situated on the summit of the ribs, throughout the length of the body) unite with the spinal apophysis of the vertebræ of the same rib, and become quite as wide as the body itself of the rib. The spinal apophyses make their appearance, even before the hatching upon the second vertebra up to the eighth. They remain very short; but, contrary to the general laws of development of vertebrated animals, they increase so much in width, after their ossification, that they form at last a series of horizontal plates of the average size.

I cannot adopt the opinion which supposes these plates to be formed in the subcutaneous cellular tissue, independently of the vertebral column, in the chorion itself or below it; that they unite afterwards with the vertebræ, and that the remarkable width of the eight pairs of intermediate ribs is also the result of contact, and subsequently of an adhesion with the osseous plates formed above these ribs. On the contrary, these assumptions are refuted by my observations.

After the successive expansion of the bodies of the eight pairs of intermediate ribs, of their superior branch, exclusively peculiar to the Chelonians and of the spiny apophyses of the same vertebræ, an osseous plate is finally formed by the contact and adhesion of the corresponding margins of all these parts, composed of numerous pieces, which extends to form the carapace above and covers the viscera. To increase and complete this shell, already very considerable, we observe other osseous plates unite with it. They are formed on the back, wholly independent of the vertebral column and of the ribs, in a very thick and solid layer of the subcutaneous cellular tissue, and must be considered as the external skeleton (cutaneous skeleton) of the animals*. Their number varies in the different species of Chelonians. In the genus *Trionyx* only one disc is found; it is situated on the neck immediately in front of the dorsal vertebræ. There are also some discs in the posterior margin of the carapace in some species of *Trionyx*; but they remain cartilaginous. Besides this nuchal plate, which is always very large, several small subcutaneous plates are also developed in most of the Chelonians. Among these, a small number only originate above the last

* These terms are borrowed from the nomenclature of M. Carus.

dorsal and the sacral vertebræ, all the rest are developed in the posterior and lateral parts of the circular cutaneous fold (limbus), the anterior portion of which is in great part filled by the anterior half of the nuchal disc, which enters progressively into that portion of the circular fold.

After the flattening of the ventral ribs, there is also, between the teguments and the muscles, in the layer of a thick and solid cellular tissue which joins these different parts, a development of some cartilaginous pieces, of which the plastron is subsequently formed. I have not been able to determine the moment at which their formation commences. The inconsiderable development of the plastron in the oldest embryos, and in the individuals scarcely hatched, leads me to conjecture that it is hardly formed before the middle of the embryonic life, and at all events relatively later than the sternum of birds and mammals. The cartilaginous pieces themselves, appearing as the foundation of the plastron, are at first, for the most part, simple bands, very narrow and thin, forming two pairs, situated one before and the other behind the umbilical aperture. Between these two pairs a very considerable space still exists at the period of hatching. Moreover, there is generally formed, or at least in most of the Chelonians (excepting the *Sphargis* ?), between the anterior extremities of the two even front pieces, a small odd or fifth cartilaginous plate. Subsequently other numerous osseous pieces are developed in these different cartilages, commonly or perhaps always nine in number. Their respective size is very variable, according to the different species of Chelonians; for, either they grow so much one before another that they meet at their corresponding margins, throughout their length, so as to form a perfectly united plastron, or their growth continues more limited, and then they form a plastron open in the centre, or merely a narrow ring, as is probably the case with the *Sphargis*. Moreover, the development of the plastron differs also in the fact, that its circumference, and especially its length, become relatively greater in some species of Chelonians than in others. It then passes beyond the neck and the tail below forming an elongation clothed by the chorion alone, whilst this elongation is wanting in other species. This difference probably depends on the previous existence or not on the ventral side of the body, below and before the anterior feet, and below and behind the posterior feet, of a transversal fold of the chorion, into which the growing plastron might enter. Thus it is probable that the species which exhibit the elongation just described are those in which such a fold already existed. This fact is rendered very probable by the examination of the Chelonians of the genus *Trionyx*, in which this fold is in fact found; but it is

scarcely filled by the parts of the plastron, little developed in this genus.

A specific and very remarkable feature in the Chelonians is subsequently the relation of their bones of the trunk with the very solid subcutaneous cellular tissue, forming a layer of little thickness and commonly considered cartilaginous. All the osseous pieces contiguous to this layer, namely, the spiny apophyses of the vertebræ from the second up to the eighth, the eight pairs of intermediate ribs, the supplementary plates of the shell, and often also all the pieces of the plastron, after having lost by reabsorption on their external surface the periosteum, come in contact with the subcutaneous cellular tissue. This happens after the hatching of the embryo and principally on the ribs, so that the periosteum disappears gradually, from the upper extremity (nearer to the vertebræ) toward the lower extremity. In the marine Chelonians it does not disappear wholly on the lower extremity, but only as far as the part of the ribs which never expand to any extent. As soon as the osseous substance of this part comes in immediate contact with the subcutaneous cellular tissue, numerous medullary cellules appear in the direction of this tissue, which, at least in the commencement, are externally open. By degrees their number increases considerably, and the bones which I have just named become at the same time stronger and very porous, although there may be, according to the species, a marked difference in their porosity. The cellules are not principally filled with fat, as is the case in more perfect vertebrated animals, and even in the Chelonians, in the bones further removed from the chorion; they are filled by the subcutaneous cellular tissue. This tissue enters gradually by the apertures of the cellules as by a radiation of numerous small roots, and collects there always in proportion to their growth. Nevertheless the layer of this tissue situated between the bones and the chorion constantly diminishes, not only relatively, but also in part absolutely, so that it seems wholly to be wanting on the carapace and the plastron in some Chelonians, especially in the *Emys europæa*.

If we consider, as usual, the plastron of the Chelonians as a portion of the nervous skeleton and as the homologue of the sternum of the other vertebrated animals, we must also admit that the bones composing the scapular and the pelvic arches are situated in a wholly contrary manner to the general disposition of these parts (when they exist) in the other vertebrated animals. They would be situated so as to remain wholly inexplicable, according to our present knowledge of the development of the animals. But, from some facts, I believe I can prove evidently that the plastron is nothing else than a part of the cutaneous skeleton, and that, in

an anatomical point of view, it has nothing in common with the sternum of other animals. This supposition once admitted, we may refer the situation of the bones of the shoulder and the basin of adult Chelonians to the relations existing in other animals. There is then no longer anything extraordinary in the arrangement of these parts, but only something specific produced by the curious development of the dorsal parts of the body. With respect to the position of the scapulæ, they are situated before the ribs in older embryos and in young Chelonians, and it is more than probable that they occupied this position even before the development of the ribs had made any sensible progress, and that they were not merely protruded by the ribs in consequence of the rapid growth of the body in width. In fact, the first pair of ribs, near and a little in advance of which they are situated in older embryos and young individuals, is scarcely remarkable either for its very great length or its width; it is on the contrary extremely short and thin, so that a displacement of the scapulæ becomes impossible. Moreover, we see in some fishes, some Saurians (*Titigna sincoïdes*), and even in a mammal (*Ornithorhynchus*), the scapulæ occupying a similar position in front of the ribs. In the *Didelphis virginiana*, the whole scapula, or at least the lower part with the scapular articulation, is situated anterior to the ribs, and it thus becomes probable that in these animals also, at least in a period previous to their development, the entire scapula, before it acquires its oblique position and its considerable width, is situated in front of the ribs. In other mammals the scapulæ (although they are never so protruded as in the Chelonians and the *Ornithorhynchi*) meet in the first period of their development much further in advance than in the subsequent periods. In the hog, for instance, the scapula, a little after the formation of the anterior foot, covers the two anterior ribs of the corresponding side. When it is not perceptible as a separate part, it does not at the commencement go beyond the first rib, whilst it extends from the first up to the seventh in adult hogs.

Lastly, the direction of the scapulæ in the Chelonians does not differ much from that which is observed in the *Ornithorhynchi* and several Saurians, in which they also occur perpendicular. Their situation below the osseous parts of the back in the adult Chelonians is produced subsequently by the successive development, for even in the oldest embryos they are in immediate contact, by their upper extremities, with the layer of the subcutaneous cellular tissue.

The metamorphosis which I have just described results from the considerable expansion of the second pair of ribs, extending

beyond the adjoining parts of the skeleton, the first pair of ribs and the scapulæ, in the form of a dome.

The position and articulation of the pelvis of the Chelonians differ absolutely in nothing from the normal type which vertebrated animals present as regard the relations of position of the pelvian bones; for the coxal bones of the Chelonians are joined to the os sacrum as in the mammals and in the Saurians in general. Thus they offer nothing in particular, except that they are covered by other osseous parts. This covering, which we find over the whole pelvis of the Chelonians, results in a small part from an enlargement of the penultimate pair of the ribs, but principally from the development of the cutaneous skeleton, for almost the whole posterior part of the shield, forming in most of the Chelonians a roof above and behind the pelvis, is composed of osseous pieces, developed near the chorion and independent of the vertebral column and the ribs.

With respect to the fact that we find both the humeri and the femora of the Chelonians covered above, and in some species also more or less underneath, this is generally in consequence of the longer or shorter lateral folds of the chorion, in which peculiar osseous pieces belonging to the cutaneous skeleton are developed. It is likewise owing to this, that of the eight pairs of intermediate ribs very much elongated and directed outwards, the last two are moreover turned greatly backwards, and in several Chelonians, but not in all, the two anterior ones forwards; the former extend beyond the coxal articulation, the latter beyond the scapular articulation.

These facts appear to me to demonstrate the error of the common assertion, that in the Chelonians the bones composing the shoulder and the pelvis are within the body. The arrangement of the peritoneum in the Chelonians proves it even in a positive manner, for it does not envelope on the two sides any of the osseous parts of the shoulder nor of the pelvis with their muscles: it clothes them only on a single side, that turned towards the intestines. Behind, it enters, as in the mammals, at a distance in the cavity of the upper pelvis, clothes in part its internal surface and the muscles which are fixed there, and passes thence over the viscera placed in this pelvis. Finally, it proceeds beneath the dorsal part of the body up to the scapulæ (situated, as I have said, far anteriorly), enveloping the lower surface of the kidneys, the internal genital parts, the inferior surface, and the external margin of the lungs, with almost their whole upper surface adhering to the ribs, and the portion of the ribs extending laterally beyond the lungs and the urinary organs. After having passed the lungs, which reach in front the scapulæ, over the

scapulæ and the posterior surface of some of their muscles, it goes along them in descending, and turns backwards to envelope in part the upper surface of the pericardium, and above all, on each side and behind the pericardium, the upper surface of the two pairs of clavicles with their muscles. From thence it passes lastly on to the abdominal muscles. A very large fold of the peritoneum, proceeding from the dorsal side and the anterior side of the body, envelopes the intestine, causing it to form a very large mesentery, then the stomach, the liver, the viscera and the pancreas.

XXXVI.—*A List of Shells dredged on the West Coast of Davis's Strait; with Notes and Descriptions of eight new species.* By ALBANY HANCOCK.

[With a Plate.]

IN 1841 I received the shells comprised in the following list; they were collected by my friends Messrs. Warham and Harrison, masters of whaling vessels belonging to the port of Newcastle. These gentlemen took with them dredges for the purpose of gathering marine productions during their Arctic voyage; and so effectually did they use these implements, that in one fortnight's dredging, the only opportunity that occurred, they procured, besides a considerable collection of *Crustacea*, thirty-four species of *Testaceous Mollusca*,—as many as were obtained by Captains Parry and Ross during their various northern expeditions.

The collection contains many of the novelties discovered by our Arctic navigators, and also eight species which appear to be undescribed. The whole, with the exception of one, a littoral species, which was obtained from the rocks in the same locality, were dredged in a small bay or harbour, in a deep inlet on the west coast of Davis's Strait (lat. $66^{\circ} 30'$, long. 68°), on a bottom composed chiefly of a stiffish blue clay. At low tide there are from twelve to fifteen fathoms water in the bay; but during spring tides the rise is five fathoms, an unusual height for those latitudes. The prevailing rocks in the neighbourhood are trap and granite.

Though I might have confined myself to describing merely the new species, it seems preferable to give the list entire; as such lists are useful in forwarding our information on the geographical distribution of species; and besides, many of those already described are very little known. At present, too, the Arctic shells possess a peculiar interest derived from the recent theories respecting the early glacial period of Europe, to the full appreciation of which a critical knowledge of species is necessary.

There are four or five species in the list related to *Buccinum*

undatum, about which a few remarks may be desirable. The allies of this species appear to be little known, and it is, therefore, with some hesitation that I have ventured to describe what I conceive to be three or four new species of them: this I should scarcely have done, had they been from different localities and from various depths of water.

The three principal varieties of *B. undatum* are never found mingled together; so far as I know, they belong to distinct localities; and their difference of appearance is probably owing to this cause. The variety with a coloured mouth, flattish whorls, and short conical spire is always procured between tide-marks; the heavy, coarse and much-waved shell, without an epidermis, belongs to a hard gravelly bottom, in about twenty fathoms water; and the variety with a thin delicate shell and soft velvety epidermis is procured at the depth of forty fathoms or more, on a soft bottom. The new species here described are all, however, from the same locality, and from the same depth of water. The peculiarities, then, of these species can scarcely be the effect of external circumstances, and it would therefore seem probable that they are specifically distinct; but whether so or not, it is proper that forms apparently so permanent and so strongly marked should be known; and with this view I have sunk other considerations, feeling assured that a knowledge of varieties is essential to a correct discrimination of species.

Littorina tenebrosa, Montagu sp.

Turbo tenebrosus, Mont. Brit. Shells, p. 303.

A few specimens of a *Littorina* closely resembling this species were gathered on the rocks surrounding the bay where the collection was made; they are chiefly of a dark hue, tessellated with yellowish brown, and with the whorls much rounded.

Margarita umbilicalis, Brod. and Sowerby.

Margarita umbilicalis, Brod. and Sow., Zool. Journ. vol. iv. p. 371.

This fine species occurred in great abundance and of a large size, some measuring upwards of an inch in diameter.

They vary from a pale yellowish horn-colour to a dark purplish flesh-tint, and some have the spiral striæ nearly obsolete: these are always strongest on the spire. Several of the shells are covered with an exceedingly thin, glossy, horn-like, transparent epidermis; operculum horny.

Margarita sordida, mihi.

Margarita striata, Brod. and Sow., Zool. Journ. vol. iv. p. 371; Sowerby, Zool. Beechey's Voy. p. 143. pl. 37. fig. 11.

Not by any means so abundant as the former species. Oper-

culum horny: the largest shells are three-quarters of an inch in diameter.

Dr. Gould, in his 'Report on the Invertebrata of Massachusetts,' describes a species under the name of *Margarita cinerea* which comes very near to this; but he considers them distinct, and states that he has compared the two, which I have not had the opportunity of doing.

Many of the specimens brought by Messrs. Warham and Harrison show, however, that some of the characters which he considers peculiar are not so. The spiral lines frequently cover the whole base, and the whorls of several are angulated by them; and a few have a slight projecting angle at the aperture.

The name given to this species in the 'Zoological Journal' was pre-occupied by a shell described by Dr. Leach in the Appendix to Ross's Voyage, and which has been shown by Mr. J. E. Gray (Zool. Journ. vol. ii. p. 567) to be the same as the *Turbo carneus* of Lowe, who described from specimens got at Oban four or five years after the publication of the Appendix. I have therefore ventured to substitute the name proposed above, which is somewhat expressive of the peculiar, dull, soiled appearance of this species.

Margarita Harrisoni, n. s. Pl. V. figs. 4, 5.

Shell conical, smooth, thin, white, dull, with the spire considerably produced, the apex slightly depressed, and the sides somewhat bulged; whorls five or six, much rounded; sutures deep, with numerous minute, close, depressed, spiral striæ, crossed by very minute longitudinal lines of growth; body-whorl nearly half the length of the shell, well rounded beneath; mouth round, outer lip thin, entire; pillar-lip slightly reflected over the umbilicus, which is not very large; interior of a most brilliant nacreous green. Diameter $\frac{3}{8}$ ths of an inch; height $\frac{5}{8}$ ths of an inch.

The surface of this pretty and very distinct species has a soft, smooth, waxy appearance; it is occasionally of a livid hue, and is generally more or less tinged with greenish yellow, having a subdued pearly lustre. The spiral striæ are very regular, close, and so minute that they cannot be seen without the aid of a lens; and the lines of growth are still finer. The umbilicus is much smaller in proportion than in either of the preceding species. Several specimens occurred.

This species is named after Mr. Harrison, one of the gentlemen who collected the shells comprised in this list.

Buccinum hydrophanum, n. s. Pl. V. fig. 7.

Shell oblong-ovate, very thin, smooth, somewhat glossy, of a soiled purplish or livid white, with fine longitudinal lines of

growth ; spire considerably produced, conical ; whorls seven or eight, ventricose, the last one about half as long as the shell, occasionally with a few distant obsolete spiral keels or ridges ; mouth roundish ovate, shorter than the spire, with the interior of a deep rich glossy chocolate-brown, extending for a considerable way over the columella, which is smooth and regularly arched ; outer lip thin and strongly lobed in front ; canal very short and wide ; epidermis pale yellow, thin, horny, smooth and shining. Length $2\frac{3}{4}$ inches ; breadth $1\frac{1}{4}$ inch.

This fine species resembles in general habit the delicate, elongated varieties of *B. undatum*, but is entirely destitute of longitudinal plaits and is quite smooth. But were other characters wanting, it might at once be distinguished from that, and from all the other species with which I am acquainted, by the wide spread of the enamel over the columella and body-whorl. It would therefore appear that the mantle on the right side of the animal of *B. hydrophanum* is considerably more expanded than in any of the allied species. The mouth, too, is broader than in *B. undatum*, particularly in front ; the canal is shorter and much wider, and the columella smoother and more regularly arched. It also seems nearly related to *B. Humphreysianum* and *B. fusiforme* of Kiener ; but differs from both in the character of the columella and in the more rounded mouth ; also in the absence of striae.

The outer layer of shell in *B. hydrophanum* is very opaque, white and chalky, and is liable to be eroded : it is quite distinct from the layer beneath, which is vitreous and of a vinous colour. The keels or ridges on the body-whorl are irregular, and frequently interrupted ; they vary in number from one to nine, and are occasionally arranged in pairs : they are, however, frequently obliterated, and are never conspicuous, even in full-grown individuals. The epidermis is confined to the body-whorl and readily peels off.

The most striking feature however of this species is the extraordinary change in colour and appearance which take place on the shell being immersed in water, when in a short time it loses its opacity and becomes of a deep rich vinous hue. This ensues immediately on the outer coat becoming saturated, which in this, as in many of the Arctic shells, is very porous.

In young specimens the outer covering of shell is very thin, and the colour of the under layer is always more or less apparent : in this state they have a bluish bloom, and are very delicate and glossy. They are sometimes covered with minute spiral striae ; and as the lines of growth are then very distinct, the whole surface is sharply and finely decussated. As the shell increases in size this appearance diminishes, and in half-grown individuals

no traces of it remain, for at an early stage the outer layer towards the apex becomes eroded, and the striæ consequently completely destroyed.

This well-marked species occurred in great abundance; nearly forty specimens were brought.

Buccinum undulatum, Möller.

Buccinum undulatum, Möller, Index Mollus. Grœnl. p. 11.

There are two specimens of a *Buccinum* in the collection, one much injured, the other immature, which I think must be referred to this species. They agree very well with the description in the 'Index Molluscorum Grœnlandiæ,' excepting that they want the waved ribs: the whorls are very much rounded, and have strong, raised spiral lines of a reddish brown colour interrupted with white. The larger shell is upwards of an inch and three-quarters in length.

This appears to be a very distinct species.

Buccinum tenebrosum, n. s. Pl. V. figs. 1, 2.

Shell ovate, ventricose, very thin, glossy, of a dark obscure violet, clouded and spotted with grayish white and tawny, particularly at the sutures, where the spots are usually well-defined; whorls six or seven, much rounded, and covered with fine waved lines of growth, and a few minute, depressed spiral lines obsolete on the body-whorl; body-whorl one-third longer than the spire, with eight or nine strong, distant spiral ridges or keels, three or four of which are continued on to the third whorl; mouth as long as the spire, broadish oval, with the interior of a dark chocolate-brown extending over the columella; outer lip thin, entire; columella very dark, glossy, rather straight, with an obsolete plait or fold, which gives to it the appearance of being twice bent; the inner margin is well raised and considerably reflected; the canal short and rather wide; epidermis very strong, of a greenish horn-colour, glossy, with fine distant longitudinal laminæ, bearing minute widely separated cilia. Length $1\frac{1}{2}$ inch; breadth nearly 1 inch.

The dark colour, the fragile, horn-like texture, the short, thick form, much rounded whorls, and spiral ridges give to this species a very characteristic appearance. The ridges vary a little in number, but are nevertheless pretty regular, and seem constant. The lines of growth have a smooth, polished appearance, and are much more conspicuous than the depressed spiral lines, especially on the body-whorl, where in many specimens they are scarcely to be traced.

It would appear that this, like many of the allied species, is occasionally plaited at the sutures of the whorls, for out of eight

that were brought one was so plaited in a slight degree. The outer coat of the shell is generally eroded towards the apex.

This species is probably related to the *B. boreale* of Leach, but is undoubtedly distinct, for Mr. Gray states in the 'Appendix to Beechey's Voyage,' that that species has much the habit of the waved varieties of *B. undatum*, which is not the case with this shell. The *B. cyaneum* of Beck appears to come much nearer, though it also is probably distinct; the *B. undatum* of Fabricius being given as a synonym, and the description of it in the 'Fauna Grœnlandica' differing widely from the specimens brought by Messrs. Warham and Harrison: be this, however, as it may, Beck's name cannot be retained, for it was pre-occupied by a very different shell described by Chemnitz.

Buccinum sericatum, n. s. Pl. V. fig. 6.

Shell ovate, ventricose, very thin, of a pale chestnut-colour, irregularly varied with paler longitudinal belts; spire not much produced; whorls six, ventricose, somewhat abruptly rounded behind, with fine spiral striæ, and a few distant stronger ones crossed by minute lines of growth, giving the surface a wrinkled or shagreened appearance, visible only by the aid of a lens; body-whorl one-third longer than the spire; mouth roundish ovate, one-half longer than the spire; outer lip thin, sublobed in front; interior of a pale chestnut or fawn-colour; columella smooth, pellucid, short, glossy, much and regularly arched, the bend more forward than usual; epidermis of a greenish horn-colour with a delicate silky gloss when held to the light, caused by the minute cilia that clothe it, which through a lens are perceived to rise from fine longitudinal laminae; the cilia are regular and not much crowded. Length 1 inch; breadth $\frac{1}{4}$ inch.

This is shorter and more ventricose than any of the preceding species, and is very delicate and horn-like. It differs from *B. tenebrosus* as well in size and colour as in having the mouth much longer in proportion to the spire: the whorls are also somewhat abruptly rounded above, which is not the case in that species; and the columella has the gloss spread further over, is quite smooth, and in some specimens is so transparent that the pillar can be seen through it; the bend also is simple and rather lower down; the surface of the shell is more strongly marked by the striæ, and the strong spiral ridges or keels are wanting.

Buccinum cyaneum, Chemnitz.

Buccinum cyaneum, Chemn. Conch. vol. x. p. 182. tab. 152. f. 1448.

A single specimen was dredged; it is quite young (measuring seven-eighths of an inch in length), but agrees pretty well in ge-

neral habit with the figure in Chemnitz: it is however of a pale greenish horn-colour, except towards the apex, where it is of a dingy bluish gray, and the spiral striæ appear to be more crowded. The columella in front is straight, and has a decided plait or fold. The epidermis is ciliated.

This is closely related to *B. Humphreysianum*, but may be distinguished from that species by its more ovate form, by the decided plait on the columella, and by the character of the surface, which is much more irregularly and strongly marked with the lines of growth, causing it to be slightly wrinkled longitudinally, as represented in Chemnitz's figure.

Buccinum Grælandicum, n. s. Pl. V. figs. 8, 9.

Shell ovate, thin, dull, of a pale reddish fawn-colour; spire well produced, conical; whorls six or seven, ventricose, somewhat angulated in the centre, with indistinct longitudinal plaits, and two strong distant noduliferous spiral ridges or keels on the centre of the body-whorl, one of which passes up the spire: the whole surface is divided by depressed spiral lines into broad flattened striæ, which are crowded with finer spiral striæ of a similar character crossed by minute lines of growth, giving the surface a shagreened appearance; mouth roundish oval, partaking of the colour of the shell; outer lip thin, slightly reflected; interior with two grooves corresponding to the spiral ridges; canal longer than usual, and rather broad; columella with an indistinct plait, well bent in the centre, straight in front, with the anterior extremity sloping to the left, pale, very thin and pellucid; epidermis inconspicuous, very delicate, smooth, greenish yellow and horn-like. Length $1\frac{3}{8}$ inch; breadth $\frac{3}{4}$ inch.

The surface of this shell is peculiar: it is smooth and entirely without gloss, and to the naked eye the broad flat striæ only are visible; a lens is required to show the minute shagreened appearance caused by the fine decussations. The longitudinal plaits are strongest on the spire, and are most conspicuous on the centre of the whorl; the nodules on the spiral ridges are at the points where they are crossed by the plaits.

This species has considerable resemblance in general form to the *B. glaciale* of Lamarck, but is much smaller and very much thinner, judging from Kiener's figure and from the figure in Chemnitz. It differs from that shell also in the greater length of the canal, in the shape of the columella, and in the character of the surface of the shell. It probably likewise resembles *B. polaris* of Gray, but the characters that distinguish it from *B. glaciale* will also distinguish it from this species.

Two specimens were procured; one appears to be adult.

Cancellaria costellifera, Sowerby sp.

Murex costellifer, Sowerby, Min. Conch. vol. ii. p. 225. tab. 199. f. 3.

Cancellaria buccinoides, Couthouy, Bost. Journ. Nat. Hist. vol. ii. p. 105. pl. 3. f. 3.

Cancellaria Couthouyi, Gould, Report on the Inverteb. of Massachusetts, p. 283. f. 190.

Two specimens were brought; one is three-fourths of an inch long and nearly half an inch broad. They differ from the general appearance of the shell by having no longitudinal folds, and by having the whorls rounded, and not flattened above; the columella too has only a single obsolete plait. There can be little doubt, however, that they belong to this species, which is stated to be very variable in form.

Fusus Sabini, Gray sp. Pl. V. fig. 10.

Buccinum Sabinii, Gray, Append. Parry's 1st Voy. p. 211.

A single specimen of a *Fusus* resembling *F. Islandicus* was procured; it is undoubtedly distinct from that species, but is probably the *Buccinum Sabinii* of Gray. It differs from it however in some respects, particularly in the canal, which in *B. Sabinii* is stated to be shorter than that of *F. Islandicus*, whilst in the shell brought by Messrs. Warham and Harrison, it is longer. It is much thinner than any of the varieties of that species with which I am acquainted; and the whorls, which are covered with rather strong, raised spiral lines, are more ventricose, and are decidedly flattened above at the sutures: the canal is not only longer but is more contracted at its commencement, and widens a little towards the front or apex; the mouth is therefore better defined, and is much more rounded; including the canal, it is considerably longer than the spire. The columella is pellucid, and the epidermis very pale, horn-coloured and delicate. Length upwards of $1\frac{1}{2}$ inch; breadth $\frac{1}{4}$ inch.

Fusus pellucidus, n. s. Pl. V. fig. 3.

Shell fusiform, elongated, thin, glossy, of a yellowish horn-colour, pellucid; spire much produced; whorls seven, well rounded; sutures deep, with rather distant, strong, but very slightly raised spiral striae, and strong, smooth, longitudinal close-set ribs or plaits, most conspicuous on the second, third and fourth whorls, and becoming obsolete on the body-whorl and apex; mouth considerably shorter than the spire, elliptical, terminating in a short, wide canal, slightly recurved; columella smooth; outer lip thin, with the interior crenulated in conformity with the exterior striae. Length $\frac{3}{4}$ inch; breadth $\frac{1}{8}$ inch.

This species, of which only one individual was procured, is very

thin and of a horny appearance; and small as it is has much the general habit of *Fusus Islandicus*, though very much shorter in the canal. Perhaps it is still a better miniature representation of *F. Koninckii* of Nyst, a tertiary fossil from Baesele.

Fusus Fabricii, Beck sp.

Trophon Fabricii, Beck, in Möller's Index Mollus. Grœnl. p. 14.

Tritonium craticulatum, O. Fabr. p. 400.

Murex borealis, Reeve, Conch. Icon., Murex, pl. 30. f. 145.

A single specimen of this delicate and beautiful species occurred. It agrees very accurately with the description in the 'Fauna Grœnlandica' excepting that it is considerably larger, measuring three-fourths of an inch in length; it is stated, however, in the 'Index Molluscorum Grœnlandiæ' to be fifteen lines long.

The *Murex borealis* of Reeve, as represented in the 'Conchologia Iconica,' is a very good portrait of the shell brought by Messrs. Warham and Harrison; if therefore I am right in placing it with the *F. Fabricii*, the *Murex borealis* must sink into a synonym.

Fusus turricula, Montagu sp.

Murex turricula, Mont. Test. Brit. p. 262. t. 9. f. 1.

The collection contains a single, dead, much eroded specimen of this species.

Pleurotoma decussata, Couthouy.

Pleurotoma decussata, Couth., Bost. Journ. Nat. Hist. vol. ii. p. 183. pl. 4. f. 8.

A single specimen was procured: it is three-eighths of an inch long and two-tenths of an inch broad. It agrees pretty accurately in general form with the *Pleur. decussata* of Couthouy, as figured and described in Gould's 'Report on the Invertebrata of Massachusetts'; but it is represented more turreted than the specimen from Davis's Strait, and also more reticulated. I think it probable, as suggested by Dr. Gould, that the *Pleur. reticulata* of Brown belongs to the same species.

Velutina zonata, Gould.

Velutina zonata, Gould, Report on the Inverteb. of Massachusetts, p. 242.

A fine large individual of this shell was obtained; it is five-eighths of an inch long and the same broad. It wants the zones spoken of by Dr. Gould, and differs slightly in other particulars from his description.

This is nearly related to the *V. undata* of Smith, a fossil species procured from the glacial beds of the Clyde, but is, I am inclined to believe, distinct. The shell from Davis's Strait is thinner,

much larger, and has the outer lip not so broadly reflected on the columella; the groove also on the pillar-lip is not by any means so broad, and it is gradually lost, revolving into the shell; whilst in the *V. undata* it commences behind with comparative abruptness; the inner edge of the columella of the former is therefore twisted as it runs up the pillar, but is nearly straight in the latter.

It is right, however, to observe that the surface of the two species is much more alike than would appear from the description in the 'Wernerian Transactions,' which is undoubtedly from worn specimens. In the Newcastle museum there are three or four shells from the Clyde district, which, I believe, were received from Mr. Smith. These specimens agree pretty accurately with the description given by that gentleman, but when closely examined with a glass small portions of the true surface are found adhering, and they are minutely spirally striated in the same manner as in *V. zonata*.

Natica Grænlandica, Beck.

Natica Grænlandica, Beck, in Möller's Index Mollus. Grœnl. p. 7.

Only one specimen occurred: it is small, measuring no more than seven-sixteenths of an inch in length; and it is rather doubtful whether it belongs to this species or not; from which it differs likewise in being thinner, and in having the sutures of the whorls more deeply impressed. In this respect it agrees better with the *N. borealis* of Gray, to which, indeed, it seems closely related.

Patella rubella, Fabr.

Patella rubella, O. Fabr. p. 386.

A single specimen was taken adhering to a large *Psolus*, resembling the *Holothuria squamata* of Müller: the *Patella* agrees very accurately with the description given by Fabricius, though instead of being entirely red it has only the apex of that colour; the rest is of a tawny horn-colour.

Pecten Islandicus, Müller sp.

Ostrea Islandica, Müller, Zool. Dan. Prod. no. 2990.

Three or four specimens occurred: they have the valves more distinctly ribbed than in those brought from the coast of Newfoundland.

Pecten Grænlandicus, Sowerby.

Pecten Grænlandicus, Sow. Thesaur. Conchyl. vol. i. p. 56. pl. 13. f. 40.

Pecten vitreus, Gray, App. Parry's 1st Voy. p. 214.

There are three specimens of this delicate, diaphanous species in the collection: they agree pretty accurately with Mr. Gray's

description of *Pecten vitreus*, and I think are undoubtedly his species. The specimens brought by Parry, however, seem to have wanted the fine, numerous, slightly depressed radiating striæ on the right or lower valve; but these striæ are not by any means conspicuous; it is therefore possible that Mr. Gray may have overlooked them. They have also escaped the notice of Mr. G. B. Sowerby, jun., who figured and described from the specimens brought by Messrs. Warham and Harrison. It is probable likewise that this character may occasionally be wanting, for in one of the three specimens they are almost obliterated; and the right valve is always more or less eroded, having a thin, opaque chalky outer layer that readily falls off. The left valve has a few distant, broad, rounded, almost obsolete rays, which are only discernible with a side light.

Mr. Sowerby's name must have precedence, as the one given to this species by Mr. Gray was pre-occupied.

Nucula inflata, n. s. Pl. V. figs. 13, 14.

Shell subtriangular, a little oblique, ventricose, thin, smooth, covered with a shining greenish yellow epidermis, slightly concentrically wrinkled; umbones small, eroded, placed much to one side; posterior slope long, somewhat flattened, slightly convex; anterior slope rather short, straight, and with a shallow cordate depression; basal margin regularly rounded, entire, forming rather abrupt angles at its junction with the sides, particularly in front; hinge with twenty teeth on one side and twelve on the other. Length $\frac{9}{16}$ inch; breadth $\frac{1}{8}$ inch; depth $\frac{6}{16}$ inch.

This species is not unlike *Nucula tenuis*; the greater size and more angulated form however of *N. inflata* will readily distinguish it; it is also much longer in proportion to its breadth, is very much more ventricose and less oblique; its teeth are also more numerous.

A single individual occurred; it was dead, but quite perfect.

Leda rostrata, Lamarck sp.

Nucula rostrata, Lam. 2nd ed. vol. vi. p. 504.

Leda buccata, Stp. in Möller's Index Mollus. Grœnl. p. 17.

This species differs considerably from the *Arca rostrata* of Montagu: it is larger and appears to be much more ventricose; the rostrated end is more abruptly truncated, and is scarcely at all bent.

Only one specimen was procured: it is $\frac{1}{8}$ inch broad and nearly $\frac{1}{8}$ inch long.

Leda minuta, Fabricius sp.

Arca minuta, O. Fabr. Fauna Grœnl. p. 414; Chemn. Conch. vol. x. p. 351. t. 170. f. 1657, 1658.

This nearly resembles the *Nucula minuta* of British authors,

but is I think distinct; it is about the same size and has the like strong, transverse ribs; the rostrated end, however, is not so long, is less arcuated, is more abruptly truncated, and the umbones are nearer the centre. Breadth $\frac{1}{8}$ inch; length $\frac{1}{6}$ inch.

Two specimens were dredged.

Modiola nigra, Gray.

Modiola nigra, Gray, App. Parry's 1st Voy. p. 244.

Mytilus discrepans, Mont. Brit. Shells, Supp. p. 65. t. 26. f. 4
(not of the body of the work).

A fine series of specimens were brought, some of which are totally black, others are varied with olive-brown; and the young are of a pale greenish olive: the striae are considerably coarser in some than in others, and the dorsal margin is occasionally more arched than usual. Some of the largest are $1\frac{1}{8}$ inch long and $\frac{7}{8}$ inch broad.

Modiola levigata, Gray.

Modiola levigata, Gray, App. Parry's 1st Voy. p. 244.

Mytilus discors, O. Fabr. Fauna Grœnl. p. 418?

An extensive suite of this fine *Modiola* was procured; many of them are much larger than those from which Mr. Gray described; some are $1\frac{1}{8}$ inch long and $1\frac{1}{8}$ inch broad.

There is, however, no doubt that they belong to this species: the surface being almost devoid of radiating striae gives to it a very characteristic appearance.

Dr. Gould, in his 'Report on the Invertebrata of Massachusetts,' includes this species amongst the synonyms of his *Modiola discrepans*, which is quite distinct from the shell so named by British conchologists*.

The *Modiola discrepans* of Gould is probably the *M. levigata*, but there are several points of difference. The latter is less winged on the dorsal margin, and is more abruptly rounded at the posterior end; the radiating ribs on the anterior portion are not straight as in that species, but are regularly waved and are more numerous, there being sometimes as many as fifteen; but even on this portion of the shell, the ribs are generally more or less obliterated, and consequently it is difficult to ascertain their number. The posterior compartment is almost always smooth, but occasionally traces of very fine radiating striae may be observed at the margin. The middle compartment has rarely a few distant, fine, depressed radiating lines; the whole surface is a good deal wrinkled concentrically, and the epidermis is very

* The *Modiola discors* of Gould appears to be the true *M. discrepans* of Montagu (not of the Supplement), differing only by having a few ribs more on the anterior compartment: and the *M. nova* of the same author is the *M. nigra*—the *discrepans* of Montagu's Supplement.

glossy except on the posterior portion, where the brightness is considerably subdued. Old specimens are almost entirely black; the young are varied with rich brown, black and pale yellowish green, or are wholly of the latter colour.

There can be no doubt that the variety *β. substriata*, which Mr. Gray thought might prove distinct, belongs to this species.

I think it probable that the *Mytilus discors* of Fabricius includes this species, though under that name he appears to have described more than one kind; for he states that whilst the young are striated at both ends, the old are smooth on the front portion. This is not the case with the suite brought by Messrs. Warham and Harrison; the young, and some of them are very small, are quite smooth on the posterior compartment.

Tellina calcarea, Gmelin.

Tellina calcarea, Gmelin, p. 3236. no. 38.

Tellina proxima, Brown, Wern. Mem. vol. viii. t. 1. f. 21; Sowerby, App. Beechey's Voy. p. 154. t. 44. f. 4.

This did not occur abundantly; only six or seven specimens were dredged. The epidermis occasionally covers almost the whole shell, and is generally more entire than in the specimens from which Mr. Sowerby described.

Astarte semisulcata, Leach sp.

Crassina semisulcata, Leach, App. Ross's 1st Voy. 8vo ed.

Astarte lactea, Brod. and Saw., Zool. Journ. vol. iv. p. 366; Sowerby, Zool. Beechey's Voy. p. 152. pl. 44. f. 12.

Crassina corrugata, Brown, Conch. of Great Brit. 2nd ed. p. 96. pl. 40. f. 24.

Crassina Withami, Smith, Wern. Mem. vol. viii. pl. 1. f. 24, 25.

This is rather a variable species, but may always be distinguished from *A. boreale*, with which some conchologists have confounded it. It is sometimes nearly smooth, or only obsoletely sulcated at the umbones; in this state it is Brown's *Crassina corrugata*; others are sulcated at least half-way down, and the young, as might be expected, are furrowed over the whole surface. Individuals occur nearly black, not much compressed, and of a roundish oval, but by far the greater number are of a yellowish brown colour, with the valves very flat and much produced transversely.

This species is frequently distorted, and is generally much eroded at the beaks. It is found fossil at Bridlington; I have seen very characteristic specimens from thence in the collection of Mr. Loftus of Newcastle, who received them from Mr. Bean under his manuscript name of *Astarte lata*. The description of *Crassina Withami* of Smith agrees very accurately with the smooth varieties of *A. semisulcata*, and the figures in the 'Wernerian Memoirs' put it beyond a doubt; the straight ventral margin and

deep visceral depression in the centre of the shell being sufficient to determine the species.

This shell was taken in great profusion.

Astarte Warhami, n. s. Pl. V. fig. 10, 10. Last drawing most

Shell thin, elliptical, ventricose, with about sixty fine, close, sharp, regular, concentric ribs; ends equally rounded; umbones rather prominent, nearly central; anterior end well-produced, with the slope concave; funicle not very deep, oblong-ovate; posterior end slightly convex with the depression lanceolate; basal margin entire, well and regularly arched; epidermis glossy, pale greenish yellow; inside bluish white. Length $\frac{3}{4}$ inch; breadth nearly 1 inch; depth $\frac{1}{16}$ inch.

It would appear that this, one of the prettiest and most delicate of the genus, is not at all common; only six specimens were obtained. It is paler and brighter than is usual with the *Astartes*, and is generally marked with a few irregular dark blotches or spots, probably caused by injuries sustained by the shell. In old specimens the ribs blend at the basal margin, where the epidermis is rather coarse and wrinkled.

This species is not likely to be confounded with any other, though it has some general resemblance to *Astarte elliptica*; it is however more regularly oval and more ventricose, the colour is brighter, and the surface more glossy. It is perhaps more closely allied to the *A. Laurentiana* of Lyell, a fossil species obtained from the glacial beds of Canada, but differs from it in having the ends more equally rounded, and in the position of the beaks, which in that species are placed considerably towards the anterior end; the prominent lateral teeth are also wanting in *A. Warhami*.

This species is named in honour of Mr. Warham, the gentleman to whom I am principally indebted for this interesting collection of Arctic shells.

Cardium Grœnlandicum, Chemnitz.

Cardium Grœnlandicum, Chemn. Conch. vol. vi. t. 19. f. 198.

Venus Islandica, O. Fabr. Fauna Grœnl. p. 411.

Cardium edentulum, Montagu, Brit. Shells, Supp. p. 29.

Two or three fine fresh specimens were brought, and several single valves occurred, some of which measure nearly three inches in breadth. A young individual was also procured; it is very delicate, is more distinctly ribbed than the mature shell, and is prettily marked with zigzag lines of a pale fawn-colour.

Cardium Islandicum, Chemnitz.

Cardium Islandicum, Chemn. vol. vi. p. 200. t. 19. f. 205, 206.

Cardium ciliatum, O. Fabr. Fauna Grœnl. p. 410.

Two specimens were dredged; one is in fine condition.

little larger than the measurement given by Fabricius, but in all other respects agrees exactly with his very admirable description. The other is a single valve, and is nearly twice the size of those from which that naturalist described; it measures upwards of two inches and a half in breadth.

This species has somewhat the habit of *C. echinatum*, from which it may be readily distinguished by the absence of the testaceous spines of that species, and by having in their place the epidermis raised into a fringe of fine close cilia; the ribs are also more numerous.

Mya Uddevallensis, Forbes.

Mya Uddevallensis, Forbes, Mem. of the Geol. Survey, vol. i. p. 407.

Shell elliptical, with the posterior end much truncated obliquely towards the basal margin; ventricose, thickish, dirty white, calcareous, irregularly wrinkled concentrically, and covered with a strong rugged olivaceous epidermis; tooth of the hinge squarely truncated, entire; siphonal impression rather short, about one-third the length of the shell, not much arched forward. Length 2 inches; breadth $2\frac{3}{8}$ inches.

This species was first noticed by Mr. Smith of Jordanhill, in his paper on "The last Changes in the Levels of Land and Sea in the British Islands," Wernerian Memoirs, vol. viii., as occurring fossil in the newer pliocene deposits at the mouth of the Clyde. It has since been observed at Uddevalla in Sweden by Mr. Lyell; and Capt. Bayfield has also found it both fossil and alive in the Gulf of St. Lawrence.

Some of our best naturalists consider this form a mere variety of *Mya truncata*; I am inclined, however, to dissent from this opinion, which I do with some hesitation.

Half a dozen specimens were brought in all stages of growth, and in all of them the siphonal impression is much shorter than in *Mya truncata*, in which it is full half the length of the shell; it is likewise not so much arched forward. The shell is also always much more truncated, and the posterior margin slopes towards the base of the shell, whereas in *Mya truncata* it inclines in the contrary direction; the form of the tooth also slightly differs.

Saxicava pholadis, Chemnitz sp.

Mytilus pholadis, Chemn. Conch. vol. viii. p. 154. t. 82. f. 735.

Mya byssifera, O. Fabr. Fauna Grœnl. p. 408.

Two specimens occurred: one is $\frac{5}{8}$ inch long and $1\frac{1}{8}$ inch broad; the other is much smaller, and differs in no respect from *Saxicava rugosa*.

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2 B

Lyonsia gibbosa, mihi. Pl. V. fig. 11, 12.

Anatina striata, Gray, App. Ross's Voy.

Shell ventricose, oblong-ovate, thin, dull, opaque white, slightly wrinkled concentrically and striated longitudinally, with a delicate olivaceous epidermis; umbones large, tumid, placed a little towards the anterior end, which has the dorsal margin concave, with a rather deep ovate depression immediately under the beaks; the posterior dorsal margin straight, with the end a little twisted, slightly gaping and obliquely truncated; from thence the ventral margin is arched pretty regularly to the anterior end, which is well rounded; interior white, approaching to a pearly lustre; os-siculum triangular, with the posterior end concave. Length upwards of 1 inch; breadth $\frac{5}{8}$ inch; depth $\frac{1}{2}$ inch.

Mr. Gray informs me that this is his *Anatina striata*, but I have not been able to find the original description.

The *Mya striata* of Montagu, to which probably Mr. Gray referred his shell, is certainly distinct from the specimens brought by Messrs. Warham and Harrison. The dull opaque white colour devoid of nacreous lustre, the tumid beaks and the concavity of the margin in front of them, with the ovate depression, are sufficient to distinguish it.

The *Mya striata* of Montagu, however, is most likely a variety of *L. norvegica*, as considered by Turton; but whether so or not, Mr. Gray's name having been used cannot be retained.

This species differs from *L. norvegica* by its whiteness, opacity and want of nacreous lustre; it is not so broad, is more gibbous, and has the beaks larger and more tumid; the posterior end is not so much produced, is less squarely truncated, and the longitudinal striæ are stronger and further apart.

EXPLANATION OF PLATE V.

Figs. 1, 2. Different views of *Buccinum tenebrosum*.

Fig. 3. *Fusus pellucidus*.

Figs. 4, 5. Different views of *Margarita Harrisoni*.

Fig. 6. *Buccinum sericatum*.

Fig. 7. *Buccinum hydrophanum*.

Figs. 8, 9. Different views of *Buccinum Grœnlandicum*.

Fig. 10. *Fusus Sabini*.

Figs. 11, 12. Different views of *Lyonsia gibbosa*.

Figs. 13, 14. Different views of *Nucula inflata*.

Figs. 15, 16. Different views of *Astarte Warhami*.

XXXVII.—Excursion of an Insect Hunter in the Carinthian Highlands. By Dr. NICKERL of Prague*. Communicated by A. H. HALIDAY, Esq.

I ARRIVED at Gastein on the 30th of July, and from this, having crossed the fells† of Nassfeld and Mallnitz, I took the road up Moell-dale to Heiligenblut. This village lies on the eastern slope of the fell of the same name, scarcely an hour's walk from the source of the Moell, at an elevation of 4000 feet above the level of the sea, and in its poverty and loneliness presents anything but a cheering picture. The river Moell, which takes its rise from beneath the glacier that lies on the eastern side of the Grossglockner, five hours' distance from Heiligenblut, receives in its course many little mountain-torrents, and waters the valley which bears its name, and which, running in a direction from the north towards the south-west, opens a succession of romantic scenery. The banks of the stream, for the space of a league from its source, are overgrown with alder bushes, through which the path to Heiligenblut leads. Ridges of rock, of the most grotesque forms, from 7000 to 8000 feet in height, bound the valley on the west. These, inaccessible to the foot of man on their eastern face towards the valley, are wooded here and there with fir-trees, beech and larches; and a charming waterfall, named from an old legend, of which it was the scene, the "Maiden's-leap," arrests the gaze of the visitor. On the mountain slopes to the east of the valley, tillage and grass-fields alternate with insulated tracts of woodland, and the homely cottages of the mountaineers scattered in the intervals. The head of the valley is barely a quarter of a league across, but gradually it widens, and cultivation appears more and more, as the mountains which inclose it diminish in elevation.

The most interesting of all the excursions in the environs is to the Pasterze, and, by way of this, to the Gems-grube, which lies above Heiligenblut, five leagues to the northward. This spot, to the botanist a classical locality, where the rarest alpine plants are found in the greatest variety, is not less attractive to the entomologist, as the extent of the annexed list testifies. The path to it leads over the first (or lower) Sattel, and winds upwards athwart the face of the mountain. After an easy ascent for an hour among fir-trees, larches, and fragments of rock completely clothed with the most elegant mosses, the terracc of the first mountain-range is attained, on which a number of the dairymen's huts are seated between woods and cattle-walks. Here *Doritis Apollo* was not

* From the Journal of the Entomological Society of Stettin, 1845.

† "Tauern," provincial term, subalpine ranges on which the snow melts.

uncommon, flitting about the face of the precipice; solitary specimens of *Hipparchia Nerine* too occurred. Magnificent ferns were growing luxuriantly in crevices of the rocks, and *Campanula pusilla* with its pretty bells had taken root everywhere on the crumbled surface of the blocks of stone. For another short hour the path continues at this elevation over several little hills, where woodland, moist meadow and debris of rock alternate, past St. Bridget's chapel, from which there is a distant view westward of the Leiterbach, as it rushes thundering down its alpine dike to mingle with the waters of the Moell. Here, not far from its source, the river finds its way through a deep ravine, inaccessible all the way from the plain of ice to the lower Sattel, where the valley properly speaking begins. Along the brow of the mountains which hem in the ravine on the eastern side, the path ascends, by successive stations, among stunted pines interspersed with magnificent lawns, where the crimson blossoms of the Rhododendron blend with tall-stemmed Monkshood and the intense azure of the Gentianella. About the perpendicular cliffs, *Argynnis pales* and various species of *Hipparchia* were on the wing. The lovely *Lycena eurybia*, *eros*, *orbitulus*, *pheretes*, and delicate kinds of *Psodos*, here give full occupation to the collector, and make the choice embarrassing among the superabundance of riches. The path now turns abruptly round a jutting angle of the mountain, bringing at once into sight the sea-green pinnacles of the glacier by which the ravine is terminated, and from the heart of which the Moell gushes forth. They form a contrast truly grand with the rich vegetation of so vernal a character that is spread all around. From this the Platte (a scarpment of rock through which a rather precipitous path is cut) has to be ascended, in order to reach the Brettboden, which overlooks a great portion of the plain of ice. A countless multitude of Saxifrages with the most exquisite blossoms curtain the walls of rock, and the White Everlasting of the Alps (*Gnaphalium leontopodium*) has its lowest limit here. Rare species of *Carabus* and *Nebria* there are to delight the entomologist; and the black salamander (*S. atra*) is found in plenty by turning over the massive slabs which rest on the damp turf.

The last stunted pine now disappears, and the path continues among the finest mountain meadows, descending a little through the Pfandscharte, a narrow dell at the foot of the upper Sattel, lying eastward from, and rather below the level of, the plain of ice. Having crossed the Scharrenbach, which pours itself into the fissures of the ice, the southern slope of the higher Sattel is reached. The mountain rises 9000 feet above the sea level, and at its foot lie flowery meadows, the haunts of the finest kinds of Lepidoptera. While I recommend this spot to the entomologist's

attention, in respect to the numerous rarities it affords, I must not forget to warn him of the danger which attends collecting here. The fall of great stones and blocks from the heights, detached either by the progressive decay of the rock, or from the melted snow in sunny weather insinuating itself among the crevices, is an every-day occurrence. I myself saw a falling stone strip the scalp off a herd-boy to the brows, from the effect of which he tumbled down stunned from the spot on which he was, and sustained some dangerous injuries.

The partial ascent of the upper Sattel, which is next to be accomplished, is rather more laborious; for although the path is not very steep, the blocks which lie strewn all about and the loose stones make it arduous. The western angle of the mountain once attained, the pedestrian's toil is amply recompensed by the sight of the gigantic pyramid of the Grossglockner with its two peaks of ice. In a short half-hour the descent is made to the plain of ice, over which a great sweep is taken to reach the precipice on the east, called the Gems-grube.

The plain of ice, the Pasterze* as it is called, lying 8000 feet above the level of the sea, is a league and a half long by three-quarters wide, and is traversed by a multitude of deep cracks, which generally originate at the middle, running towards the east and west, and which must be avoided by taking a circuit where they are too broad to be leaped. To the east it is inclosed by the upper Sattel and the Gems-grube; to the west by the rocky ridges and ice-blocks of the Grossglockner, and northwards by the Johannisberg covered with perpetual snow; while southward it stretches away to the ravine in which the Moell has its outlet. After three-quarters of an hour of circuitous deviation and leaping over ice-cracks, the grand object, the Gems-grube, is reached. This lies, as was mentioned before, eastward of the plain of ice, and presents an abyss between the opposite precipices, in which the melted snow from the heights collects, and is drained off into the crevices of the ice. The chamois is often to be seen here, from which the spot derives its name, Gems-grube, the Chamois'-hole.

Here and there the face of the rock is diversified with patches of green sward and with lichens of a pale grayish shade, and though the place at first sight seems to yield but a scanty herbage, it is in truth rich in plants, and will still, in spite of difficulty, be sought by the ardent lover of nature for the sake of the unrivalled prospect of the Grossglockner. *Brya alpina* and the rare *Zomatogonium carinthiacum* reward the botanist,—the rare *Melisteæ asteria*, and many species of Lepidoptera besides,

* From *Passerix*, in Slavonic a meadow; from the nature of the ground over which the road to it passes.

the entomologist,—for the toil of clambering among the steep and rugged acclivities.

Although I have specified this spot as the richest mine of rare species, I was not able myself to visit it more than once during a stay of four weeks. On two other occasions I ascended as far as the upper Sattel, and when I had got a view, from its jutting shoulder, over the ice plain towards the Gems-grube, I was obliged to turn back disappointed, from the quantity of snow that had fallen there. And in truth this (1844) has been one of the most unfavourable seasons I could have fixed on for my excursion. Storm and snow often drove me back with my boxes empty, or kept me shut up in the house for days together; the precious time passing away heavily without a determinate object, while repiningly I turned over the leaves of the books I had brought along with me.

Not more fortunate was an excursion to the Leiter, which is indeed rich in plants and probably in insects also, but *that* Cat's-bridge, a pass of a league in length, where all one's attention is incessantly required to avoid falling over the precipice, is not well-adapted for collecting insects.

On the other hand, three excursions which I made to the Moharkopf and the Astner plains were very productive. There I found, to my not small delight, *Hepialus ganna*, a species I had never seen before, on the wing in open day. An excursion to the Alp-horn of Zirknitz too procured me, in addition to the species of *Salmo* peculiar to that locality, an extremely interesting new *Chiton*, the first of the genus that has to my knowledge been found in fresh water.

On my return I stopped for eight days at Salzburg, where a careful inspection of private collections, as well as of the extensive one belonging to the Prince Archbishop of Schwarzenberg, has enabled me to submit to the scientific public the annexed commencement of a 'Fauna Lepidopterorum' of Salzburg. My desire is, that this, imperfect as it is, may serve as an introduction to the riches of this nearly unexplored district, and may induce many of my entomological friends to frequent excursions in that direction.

PAPILIONIDÆ.

*Melitea maturna**. *M. cynthia*, three specimens taken in the meadows of the Brettboden, elevation 7000 feet. Its season seems to be the month of July. Inhabits high mountain ranges. *M. artemis**. *M. merope*, a few were found on the 9th of August about the precipices of the Gems-grube above the Mer de Glace; they were quite fresh. The insect is very wild and difficult to catch on account of its rapid flight and the nature of the ground. *M. cinxia*, *didyma*, *phæbe*, *dictynna*, *athalia*, *parthenia**. *M. asterie*, a species ex-

tremely rare and little known. Found on the most abrupt and elevated declivities, and where the vegetation was most scanty. In these desert spots they hover singly, with slow motion, over the scattered patches of turf overgrown with the common gray lichen. The Moharkopf near Döllach, and the precipices above the Pasterze at Heiligenblut, are its haunts. Its season the latter half of July.

*Argynnis selene**. *A. euphrosyne*, I found a specimen on the lower Sattel, at the height of 5000 feet. *A. dia***. *A. pales*, common in Carinthia over all alpine meadows from 5000 to 8000 feet elevation, where it is found about the various species of *Hieracium* abundant there. On the highest alps the females have the wings darker-coloured, sometimes with a steel-blue gloss, or entirely white shaded with black. Both these varieties pair with the common form. *A. hecate*, *ino* (*amathusia*), *lutona*, *niobe*, *adippe*, *aglaia*, *paphia+*, var. *valesina*, found in Moell-dale, ♀ only, and paired with the common *A. paphia*. This new species therefore must be struck out of our lists. It is related to *paphia* as *isis* to *pales*. *A. paphia* was abundant in the spots where *valesina* occurred.

*Vanessa cardui***, everywhere, extending even to the highest alps. *V. atalanta*, *io*, *antiopa*, *polychloros*, *xanthomelas***. *V. urticae***, in all states, on the highest alpine meadows. *V. c-album**. *V. prorsa*; I found the caterpillar not rare, with its web, among the leaves of *Urtica diæca*, on the way from Bockstein to Nassfeld on the 31st of July. A month later the butterfly was abundant in the valley of the Salzach.

Limnitis cucilla, *sibilla*, *carilla*, *populi**.

Apatura iris, *ilia*, var. *clytie**, var. *eos*, a fine specimen taken in Moell-dale.

Hipparchia proserpina, *hermione*, *alcyone*, *briseis*, *semele*, *statilina*, *phædra**. *H. aello*, very rare, about the rocky slopes above the glacier near Heiligenblut. The specimens taken in the beginning of August were already much wasted. *H. janira**, *eudora*, *hyperanthus***. *H. dejanira**. *H. hiera*, on the way to the Leiter, near Heiligenblut. *H. mæra*, *megæra*, *ageria*, *galathea* var. *leucomelas**. *H. cassiope*, single specimens found in the elevated meadows on the road to the Pasterze; more common in the Gems-grube. *H. pharte*, a few specimens below the Tauernhaus in the valley towards Rauris, after the middle of August. *H. melampus*, in open spots among the stunted firs; generally diffused, but nowhere common. *H. pyrrha*, only in the little mountain meadows under the Platte near Heiligenblut: not common. *H. medusa**. *H. nerine*, one of the rarer alpine species. I found only three wasted specimens, on the 3rd of August, in wooded rocky spots on the lower Sattel. It seems not to extend beyond the wooded region, as it likes shady places. *H. medea*, *ligea***; of the former species fine varieties. *H. euryale*, common on the way from Bockstein to the Nassfeld; rarer in Carinthia. *H. pronoe*, one of the commonest kinds in the alps. *H. gorge*, at the Leiter, on the rocks of the tarn of Zirknitz, and about the Astner plains near Doellach, sparingly. *H. manto*; this rare butterfly frequents the highest spots of the fells of Nassfeld and Mallnitz, as well as the

Gems-grube above Heiligenblut. Its flight is wavering and unsteady; a few paces from the spot where it rose, it darts down again among the herbage, so that it is often difficult to find it again. July is its time of appearance. *H. tyndarus*; every excursion in the higher grounds afforded this butterfly in plenty. I found at the Gems-grube a handsome variety with a silvery-white gloss over the entire lower surface. *H. davus*, *pamphilus*, *iphis*, *hero*, *arcania**. *H. satyrion*; this pretty species was abundant over the meadows of the Pasterze and the Pfandscharte. Season August.

Lycæna arion, *alcon*, *cuphemus*, *erebus*, *cyllarus*, *acis*, *argiolus*, *damon*, *alsus**. *L. pheretes*, solely, and sparingly, on the most elevated meadows above Heiligenblut, before the turn of the road round the mountain; early in August. *L. daphnis**. *L. corydon*, I found in the valley towards Rauris at an elevation of 4000 to 5000 feet. All the specimens were of the variety in which the colouring of the underside is dull, as in the var. *ixora* of *H. syllius*. *L. dorylas**, I found perfectly fresh specimens after the middle of August, on a mountain meadow lying 5000 feet high. *L. adonis*, *icarius*, *alexis**. *L. eros*, *orbitulus*; both species in tolerable plenty on the meadows through which the road to the Pasterze passes. *L. agestis*, *eumedon*, *argus*, *ægon*, *amyntas*, *polysperchon*, *hylas*, *battus*, *chryseis**. *L. eurybia*, in the elevated meadows on the hither side of the turn of the road mentioned before; also above the Platte, but is rare. August. *L. virgaurea*, *phlæas*, *lucina*, *rubi*, *quercus*, *spini*, *ilicis*, *w-album*, *pruni*, *betula***.

*Papilio podalirius**, *P. machaon***.

*Doritis apollo***, throughout the summer, in the environs of Salzburg, in the valleys of the Salzach and the Moell. *D. delius*, only among the alps. In the Pfandscharte hard by the glacier of Heiligenblut, and on the Rauris-fell, it was still in fresh condition at the end of August; while specimens taken on an excursion to the Leiter early in that month were quite wasted. It is rare. *D. mnemosyne***.

Pontia crategi, *brassica*, *rapæ*, *napi***.

The last three often deceived me among the alps, where I mistook them at a distance for *P. callidice*. Var. *brionice* in a dell of a wood at Sagritz. *P. callidice*, a single wasted specimen (♀) of this rare butterfly was taken in the Gems-grube. July seems to be the season for it. *P. daplidice**. *P. cardamines*, *sinapis***.

Colias edusa var. *helice*, *chrysotheme**. *C. phicomone*, abundant in elevated alpine meadows; is said also to occur rarely on the Geisberg, near Salzburg. *C. hyale**. *C. palæno*, found in former years on the Nassfeld. *C. rhamni***.

Hesperia malvarum var. *althææ*, *carthami**. *H. fritillum*, rare, in high alpine meadows. *H. alveolus*, *sertorius*, *tages*, *paniscus*, *sylvanus*, *linea*, *lineola**. *H. comma**, also on the highest alps.

SPRINGFLIES.

*Atychia statice**.

At. chrysoccephala, n. sp. Thorace abdomine alisque anticis cæruleo-viridibus, posticis fuscis, antennis valde pectinatis, capite auro-micante.

Size of *At. infesta*, but most nearly allied to *At. statices*. The processes of the antennæ are much longer, and not so close-set as in that species. The front, thorax and abdomen have a number of fine gray hairs standing singly, which are not found there. The head has a bright golden gloss, set off by the contrast of the hairy body, while the head and thorax appear of a uniform colour in *statices*. The present species also is but half the size, and does not occur at a lower elevation than 7000 feet. Found about the Pasterze in August, hovering in the sunshine and sitting in pairs on flowers.

*A. pruni**.

*Zygæna minos***, on the highest alps as well as in the lowlands. *Z. scabiosa*, *achillea**. *Z. crulans*, in alpine meadows 6000 to 7000 feet high; flying singly and not common. In August the specimens were generally wasted. *Z. meliloti*, *lonicera*, *filipendula***. *Z. hippocrepidis*, a few specimens only in a coppice below Döllach. *Z. angelica*, *peucedani*, *epialtes*, *falcata*, *onobrychis**.

*Syntomis phegea**.

Sesia apiformis, *asiliformis*, *culiciformis*, *mutillæformis*, *teuthrediniformis***.

Macroglossa fuciformis, *bombiliformis**. *M. croatica**, on the authority of Freyer. *M. stellatarum*, *anotheræ**.

Deilephila nerii, *celerio**. *D. elpenor*, *porcellus*, *galii*, *euphorbiæ***.

Sphinx pinastri, *convolvuli*, *ligustri**.

*Smerinthus tilia**. *Sm. ocellata*, *populi***.

BOMBYCIDÆ.

*Saturnia spini**, *carpini***.

*Agliu tau***.

*Endromis versicolor**.

Harpyia vinula, *erminea*, *bicuspis*, *bifida*, *fagi*, *mülhauseri*†.

Notodonta tritophus, *ziczac*, *dromedarius*, *cucullina*, *camelina*, *argentina*, *palpina*, *plumigera*, *dodonæa*, *chaonia**.

Cossus ligniperda, *asculi**.

*Hepialus humuli**. *H. carnus*, said to occur at an elevation of 7000 feet. *H. sylvinus**. *H. ganna*; I found this rare moth flying in the sunshine on the highest mountains of Carinthia; from the rapidity of its flight it is very hard to catch. It varies much. Time the middle of August.

Lithosia quadra, *griseola*, *complana*, *aureola*, *rubricollis*, *rosca*, *roscida**.

L. melanomos, n. sp. Alis anticis obscure fulvis nigro-punctatis, costis duabus nigris, posticis fuscis, collari et scapulis atris.

Found in the immediate environs of the Grossglockner at an elevation of 9000 feet. It appeared after a shower, flying heavily and solitary. The black collar and tippets, the wing-ribs black from their origin, the sooty shade, combined with the locality, distinguish it from *L. roscida*, to which it comes near in appearance as well as size.

L. freyeri, n. sp. Alis omnibus pallide helvaceis, anticis angustis, seriebus tribus punctorum minimorum.

Also found on the Carinthian alps, fluttering heavily in the sun-

shine about the face of rocks, in the month of August. Intermediate between *L. rascida* and *L. irrorea*. Size of the former, from which it is distinguished by the arrangement and smaller size of the black dots, the outline of the wings, and the gray colour of the underside in the fore pair. From *L. irrorea* it differs by the smaller size, outline of the wings, and by its pale colour.

L. irrorea occurs solitary both in Moell-dale and among the alps, but seems not to ascend above the limit of the pines. *L. eborina*, *ancilla*, *mundana**.

Psyche. Not a single specimen of this genus occurred in the perfect state, though so abundant in the earlier stages. It may seem incredible when I say, that in an excursion over the grassy slopes behind the turn of the road above Heiligenblut, at an elevation of 8000 feet, I came to a spot where a species of *Psyche* was in such abundance, that on looking fixedly at the ground, overspread with stones from the heights and a scanty sward, it appeared to be all in motion, like a populous ant-hill, so that one grasp, made at random, caught hundreds. I did not succeed in rearing the moth. It would be interesting to follow out the history of this, probably new, species, which occurs on the alps in millions, compared with which our most common *Tinæ* may be accounted rarities.

*Liparis monacha**, *dispar*, *salicis*, *chrysorrhæa*, *auriflua***.

Orgyia pudibunda, *fuscellina*, *antigua**.

Pygæa anastomosis, *reclusa*, *anachoreta*, *curtula*, *bucephala**.

Gastropacha betulifolia, *quercifolia*, *pini*, *pruni*, *potutoria*, *medicaginis*, *quercus*, *rubi*, *populi*, *cratægi*, *processionea*, *lanestris*, *neustria**.

Euprepia cribrum, *pulchra**. *E. grammica*; a variety with the lower wings entirely black is found in the subalpine districts, but more frequently in Lower Carinthia. About Salzburg this species has not occurred. *E. russula*, *jacobæ**. *E. plantaginis* var. *hospita*, with the lower wings white, on the highest alpine meadows in August. *E. matronalis*, Fr., seems to be rare in the Carinthian mountains. In all my repeated excursions I found but two specimens near the Mer de Glace. Its flight in the daytime is rapid and sustained, and it is hard to catch, from the precipitous nature of the ground. *E. dominula*, *hera*, *purpurea*, *aulica**. *E. matronula*; the caterpillar of this species, sought for with little success by other methods where there were traces of its presence, was obtained by removing the thin layer of turf from the rocky under-soil. *E. caja*, a ♀ freshly disclosed was found in Upper Carinthia at an elevation of 4000 feet. *E. villica*, *hebe*, *fuliginosa*, *mendica*, *menthastri*, *urticæ*, *lubricipeda**.

NOCTUÆ.

Acronycta leporina, *aceris*, *megacephala*, *alni*, *ligustri*, *strigosa*, *tridens*, *psi*, *auricoma**. *A. rumicis***.

A. euphrasie; of the only two specimens which I took of this rare moth, which is not found about Salzburg, one was taken on the planks of the water-course at Böckstein above Gastein, the second on a garden-wall in Moell-dale, early in August.

*Dipthera ludifica***, *orion**.

*Bryophila perla, ereptricula, fraudatricula**.

*Cymatophora xanthoceros, ruficollis, diluta, bipuncta, octogesima, oo**.

*Episema cæruleocephala**. *E. graminis*, frequent in Moell-dale, sitting on heads of thistles; found more abundantly nine years before on the Rossalp, where it was flying about incessantly in the sunshine. In the beginning of August the moth was already worn.

Agrotis ocellina; I took some specimens, with very clear markings, on the meadows of the Pasterze and the Moharkopf. I never met with the species below an elevation of 5000 feet. Its time of appearance is after the middle of July. *A. alpestris*, taken several times in Moell-dale and on the lower Sattel. Season the same. *A. tritici, fumosa, obeliscæ, ruris, saucia, segetum, corticæ, exclamationis, forcipula**. *A. suffusa**, a freshly disclosed specimen was found under a stone at an elevation of 4000 feet. *A. fatidica*; on the 3rd of August I was crossing the grassy slopes (on which the snow was lying a foot deep) behind the turn of the road above Heiligenblut, having in vain attempted to make my way above. In a little meadow where the snow was mostly melted I took an *Agrotis*, which I supposed to be new, not remembering to have ever seen it before, but which, on referring to Freyer's excellent figure, proved to be *fatidica*. It was flying with a very rapid and sustained flight, hovering over the snow-covered declivities, and at last settled on the turf close to me, where I caught it. A fortnight after I took a second, sitting on the flowers of a *Sonchus*, at an elevation of 7000 feet, while the former locality lay 1500 feet higher still. The Carinthian alps and the very verge of the snowy region appear therefore to be the native place, till now undetermined, of this rare species.

*Amphipyra tragopoginis, livida, pyramidea, typica, perflua, pyrophila, lucipeta**.

*Noctua raveda, augur, sigma, baja, candelisequa, brunnea, festiva, comma-nigrum, depuncta, rhomboidea, polygona, musiva, plecta**.

Tryphena comes, subsequa, pronuba var. *innuba, fimbria**.

*Hadena saponaria, perplexa, capsicola***. *H. behenis* (Freyer in litt.), n. sp.* *H. cucubali, popularis, leucophæa, cespitis, atriplicis, satura, adusta, thalassina, gemina, genistæ, contigua, convergens, distans, protea**. *H. dentina** var. *ongspurgeri*, at Brettwande in Moell-dale, and appears to be confined to the alpine districts.

*Phlogophora meticulosa, lucipara**.

Miselia casia, a single specimen was taken on a wall below Mallnitz. *M. conspersa, comta, albigula, filigramma, culta, oxyacantha, aprilina**.

*Polia chi, dysodea, saliceti, flavicincta, nigrocincta, advena, nebulosa, herbida**.

*Trachea piniperda** is not rare, yet the caterpillar has not been found to injure the plantations.

*Apamea nictitans, didyma**. *A. imbecilla*, only on the highest alps; I found it, flying in the sunshine, on the upper Sattel, where it is very rare. *A. latruncula, strigilis, testacea, basilinea**.

*Mamestra pisi, oleracea, chenopodii, brassicæ, furva, persicariæ**.

*Thyatira batis, derasa**.

348. Excursion of an Insect Hunter in the Carinthian Highlands.

*Calpe libatrix**.

*Mythimna canthographa**.

Orthosia instabilis, *munda*, *ypsilon*, *lota*, *macilenta*, *gracilis*, *gothica*, *stabilis*, *leucographa*, *cruda*, *congener*, *nitida*, *pistacina*, *litura**.

Caradrina morpheus, *cubicularis*, *blanda*, *respersa*, *trilinea*, *bilinea**.

Leucania pallens, *vitellina*, *impura*, *albipuncta*, *conigera*, *obsoleta*, *comma*, *album**.

*Gortyna flavago**.

Xanthia echii, *rufina*, *ferruginea*, *citrago*, *croceago*, *cerago**.

Cosmia fulvago, *trapezina*, *retusa*, *subtusa*, *diffinis*, *affinis*, *pyralina**.

C. cuprea, flying about flowers, in the sun, on the Rossalp near Golling, and in meadows below the Tauernhaus of Rauris. The specimens taken after the middle of August were generally wasted.

Cerastis vaccinii, *glabra*, *satellitica**.

Xylina vetusta, *exoleta*, *conformis*, *zinckenii*, *rhizolita*, *petrificata*, *conspicillaris*, *picta**. *X. rurea*, *polyodon*, *lithoxylea*, *lateritia*, *virrens*, *petrorhiza***.

Asteroscopus cassinia, *nubeculosa**.

Cleophana pinastri, *linariae**.

Cucullia abrotani, *absynthii*, *tanacetii*, *umbratica*, *lactuca*, *lucifuga*, *asteris*, *verbasci**. *C. ceramanthea*, Fr.*

Abrostola triplasia, *urticae**.

Plusia illustris, *moneta*, *festuca*, *chrysitis*, *orichalcea*, *jota*, *percontationis*, *gamma**. *P. interrogationis***, rare about Salzburg, more frequent among the lower alps. *P. ain*; I have seen but one specimen, which was found on one of the Pinzgau alps. *P. divergens* occurs at an elevation of 7000 to 8000 feet, in the meadows of the Pasterze, the Mallnitz fell, and the Moharkopf. It is remarkably wild, flying in the sunshine, about mostly inaccessible precipices, and is therefore difficult to procure.

*Anarta heliaca**.

Heliothis ononis, *dipsacea*, *scutosa*, *marginata*, *delphinii**.

Acontia solaris, *luctuosa**.

Erastria sulphurea, *fuscula*, *paula**.

*Ophiura lunaris**.

*Catephia alchymista**.

*Mania maura**.

Catocala frazzini, *elocata*, *nupta*, *dilecta*, *sponsa*, *promissa*, *electa*, *agamus*, *paranymphæ**.

*Brephos parthenias**.

Euclidia glyphica, *mi**.

Platypteryx spinula, *falcula*, *hamula*, *unguicula*, *lacertula**.

The above catalogue has not yet been carried further than the *Noctuae*. The extract given is considerably abridged, omitting the specifications of locality, &c. (except as regards the alpine species) and the detailed descriptions of the new species. Those which are found in the environs of Salzburg are here denoted by an asterisk, placed at the end of the paragraph or after the single species. The double asterisk denotes those found also in Upper Carinthia and in the valley of the Moell in particular.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

Descriptions of six new species of birds, by John Gould, Esq. :—

TROGON ASSIMILIS. *Mas. Trog. vertice, corpore superiore, et pectore aureo-viridibus; loro, auribus, guldque nigris; rectricibus intermediis duabus aureo-fuscis, viride tinctis; pogoniis lateralium duarum his proximarum utrinque externis virido-fuscis aureo splendentibus, internis autem, apicibusque, nigris; nigris quoque rectricibus externis, modo marginibus pogoniarum fasciis albis tenuibus transversim ornatis; alis nigris, tectricibus et secundariis lineis late griseis transverse flexuosis delicatissime pictis.*

Male.—Crown of the head, all the upper surface and chest rich golden green; lores, ear-coverts and throat black; two middle tail-feathers golden greenish brown, tipped with black; the two next on each side have the inner web and tip black, and the outer web golden greenish brown; outer feathers black, crossed for a short space on either side the web by very fine irregular bars, and largely tipped with white; wings black, the coverts and secondaries finely penciled with irregular zigzag markings of light grey; primaries margined externally with light grey; abdomen and under surface fine scarlet, separated from the green of the chest by a narrow crescent of white; bill orange-yellow; feet yellowish brown.

Female.—Head, chest and upper surface brown; two middle tail-feathers dull chestnut-brown, tipped with black; the two next on each side black on their inner webs and at the tip, and dull chestnut-brown on their outer webs; the remaining feathers black on their inner webs at the base, largely tipped with white, the intermediate portion crossed by alternate irregular bars of black and white; wings as in the male, but with the coverts and secondaries freckled with yellowish brown instead of grey; ear-coverts black; under surface scarlet, separated from the brown of the chest by a crescent of white; bill and feet yellowish brown.

Total length, 10 inches; bill, 1; wing, 5; tail, 6; tarsi, $\frac{4}{5}$.

Hab. Peru.

Remark.—Nearly allied to *Trogon personata*, but differing from that species in the tail being nearly black, in the transverse markings being very slight and in the extremities more largely tipped with white; the freckled markings of the wing arc also much more minute.

CINCLOSOMA CINNAMOMÆUS. *Cinc. toto superiore corpore, scapularibus, rectricibus duabus intermediis, pectore ad latera, et lateribus cinnamomeis; alarum tectricibus nigris, plumis singulis ad apices albis; lined superciliari indistincte alba; gula loreque nitide nigris; magna ovata macula infra oculum, et corpore inferiore albis; pectore magna macula nitide nigra, forma tanquam sagittæ, signata.*

The whole of the upper surface, scapularies, two central tail-feathers, sides of the breast and flanks cinnamon-brown; wing-coverts jet-black, each feather largely tipped with white; above the eye a faint stripe of white; lores and throat glossy black, with a large oval

patch of white seated within the black, beneath the eye; under surface white, with a large arrow-shaped patch of glossy black on the breast; feathers on the sides of the abdomen with a broad stripe of black down the centre; lateral tail-feathers jet-black, largely tipped with pure white; under tail-coverts black for four-fifths of their length on the outer web, their inner webs and tips white; eyes brown; tarsi olive; toes black.

Total length, $7\frac{1}{2}$ inches; bill, $\frac{7}{8}$; wing, $3\frac{3}{4}$; tail, $3\frac{1}{4}$; tarsi, $1\frac{1}{2}$.

Hab. South Australia. Shot by Capt. Sturt at the Dépôt, lat. $29^{\circ} 40'$, June 9, 1845.

This fine new species, discovered by the enterprising traveller Sturt, is of peculiar interest, as being one of the few inhabitants of the sterile and inhospitable interior of Australia, and as forming the third species of the genus known to belong to that portion of the globe; it is considerably smaller than either of its congeners, and also differs from them in the beautiful cinnamon colouring of the upper surface. It now forms part of the national collection at the British Museum.

RAMPHASTOS INCA. Fœm. *Ramph. nigra*; rostro nigro, in latcribus sanguineo obnubilato; culmine mandibulæ superioris ad apicem, et latâ fasciâ basali flavis, hac posticè lined nigra, anticè lined coccineâ cinctâ; gula et pectore albis flavitinctis, hoc torquæ sanguineo infra succincto; tectricibus caudæ inferioribus aurantiacis.

Bill black, clouded on the sides with blood-red, with the culmen and point of the lower mandible yellow, and with a broad basal belt of the same colour, bounded posteriorly with a narrow line of black, and anteriorly with a narrow line of scarlet; the yellow clouded with olive on the lower mandible; naked skin round the eye purple, passing into yellow on its outer margin; irides brown; legs and feet bluish lead-colour; general plumage black; throat and chest white, tinged with yellow, and bounded below by a band of blood-red; upper tail-coverts rich orange; under tail-coverts blood-red.

Total length, 20 inches; bill, $5\frac{1}{2}$; wing, $9\frac{1}{4}$; tail, 7; tarsi, $2\frac{1}{2}$.

Hab. Bolivia: in the elevated and dense forests at Chimorée, in the country of the Yuracaras Indians. Brought to this country by Mr. Bridges, and now in the collection of the Earl of Derby.

Remark.—Nearly allied to *Ramphastos erythrorhynchus*.

The above is the description of a female.

PTEROGLOSSUS CUCULLATUS. *Pter. vertice et occipite aterrimis; latâ maculâ semilunari ad nucham griseo-cæruleâ; dorso, humeris, apicibusque tectricum alarum majorum aureo-oleagineis, uropygia autem et tectricibus caudæ superioribus virido-flavis infectis; tectricibus alarum superioribus, pogoniis externis primariarum, et secundariis saturatè viridibus; pogoniis internis nigris; genis, guldiquæ ferrugineis, harum colore cum inferioris corporis cæruleo-griseo gradatim confuso; tectricibus caudæ inferioribus nitidè coccineis; rostro flavo-viridi obnubilato, nisi tertiad parte apicali, et maculâ oblongâ utrinque ad basin inferioris mandibulæ, nigris.*

Crown of the head and occiput deep shining black; at the back

of the neck a broad crescentic mark of blue-grey; back, shoulder, and tips of the greater wing-coverts golden olive, passing into greenish yellow on the rump and upper tail-coverts; greater wing-coverts, outer webs of the primaries and the secondaries dark green; inner webs black; sides of the face and throat sooty black, gradually blending with the dark bluish grey of the under surface; under tail-coverts shining crimson; thighs light chestnut; bill yellow, clouded with green for two-thirds of its length from the base, and black for the remainder of its length; the under mandible with an oblong irregularly-shaped patch of black on each side near the base; feet greenish lead-colour.

Total length, 18 inches; bill, 4; wing, 7; tail, $7\frac{1}{2}$; tarsi, 2.

Hab. The forests of Cocapata, department of Cochabamba, Bolivia.

Remark.—Three specimens of this highly interesting new species were brought home by Mr. Bridges; two of them are now in the possession of the Earl of Derby, and the third in the collection at the British Museum. The sexes are precisely similar in colour and markings, but the female may be readily distinguished by her somewhat smaller size and by the much smaller size of the bill.

The whole of the plumage is very dense or thick.

ODONTOPHORUS BALLIVIANI. *Odont. capite cristæque ferrugineo-rufis; infra et pone oculum latè aterrimè maculè, supra et subter lineè rubro-cerviè marginatè; corpore inferiore castaneo-fusco, nigro minutissimè maculatè; plumis singulis maculè albd ornatis.*

Head and crest rich rusty red; beneath and behind the eye a broad patch of deep black, bounded above and below by a stripe of reddish buff; upper surface olive, minutely freckled with black; the feathers of the centre of the back and scapularies with a fine line of buffy white down the apical half of the stem, and with a small double spot of black on their inner, and a large patch of black on their outer webs, bounded above and below with rusty red; primaries and secondaries brown, crossed with irregular bands of rusty red, freckled with black; under surface dark chestnut-brown or coffee-colour, minutely freckled with black, each feather with an irregularly-shaped patch of white, bordered with black near the centre, giving the whole of the under surface a singularly rich and sparkling appearance; bill black; feet lead-colour.

Total length, 12 inches; bill, 1; wing, $6\frac{1}{4}$; tail, $2\frac{3}{4}$; tarsi, 2; middle toe and nail, $2\frac{1}{4}$.

Hab. The forests of Cocapata, department of Cochabamba, Bolivia.

Remark.—I have named this new bird *Balliviani*, in honour of General Ballivian, President of the Republic of Bolivia. It is one of the finest species of that section of the group to which the term *Odontophorus* is now restricted, is nearly allied to the bird I have named *Odontophorus guttatus*, and may be readily recognised by its larger size and by the still more conspicuous marking of the under surface.

We are indebted to the researches of Mr. Bridges for our knowledge of this beautiful bird.

CALLIPEPLA VENUSTA. *Call. fronte mento gulque holoserico-nigris,*

fasciâ alba ab oculi posteriore angulo latè circumdatâ ; nigra cristâ rectâ et erectâ ; occipite ferrugineo-rufa ; pectore caruleo-griseo ; abdomine superiore cervino, medio nigro, inferiore tectricibusque caudæ inferioribus arenaceis ; plumis ad latera castaneis, mediis sed pogoniis stramineo-albis.

Forehead, chin and throat deep velvety black, encircled from the posterior angle of the eye with a broad line of white ; across the head and passing down behind the eye another line of white, bounded posteriorly with black ; crest straight, erect, and of a deep black ; occiput rusty red ; feathers of the sides and back of the neck lanceolate in form and of a blue-grey, encircled all round with brown ; back, wings, rump and upper tail-coverts olive-grey ; tertiaries edged with buff narrowly on their outer webs and broadly on their inner ones ; tail grey ; chest blue-grey ; upper part of the abdomen buff ; centre of the abdomen black ; flank-feathers rich chestnut, with a line of buffy white down the centre ; lower part of the abdomen and under tail-coverts sandy buff, with a broad stripe of greyish brown down the centre of each of the latter ; bill black ; feet brown.

Total length, $8\frac{3}{4}$ inches ; bill, $\frac{1}{16}$; wing, $4\frac{1}{2}$; tail, 4 ; tarsi, $1\frac{1}{8}$; middle toe and nail, $1\frac{3}{8}$.

Hab. Supposed to be California.

Remark.—I am indebted to the kindness of M. Louis Coulon, Director of the Museum at Neuchâtel, for the loan of this species, for the purpose of figuring in my monograph : it is the only specimen I have seen, and in all probability is the only one that has been sent to Europe ; it is a bird whose rarity is only equalled by its beauty : it is very nearly allied to *Callipepla Californica*, but is distinguished from that bird by the straight form of the crest, the rich colouring of the flank-feathers, by the absence of the scale-like markings of the abdomen, and the greater length of the tail.

ENTOMOLOGICAL SOCIETY.

May 5th, 1845.—The Rev. F. W. Hope, President, in the Chair.

Captain Parry exhibited a small collection of insects chiefly from New Holland ; also an exotic *Curculio*, with two long *Clavariæ* springing from the elytra and thorax.

The President exhibited a large Ant Lion in spirits from the plains of Marathon.

Mr. C. Lamb exhibited a specimen of *Deinacrida heteracantha* in spirits, remarkable for its immense mandibles.

Mr. S. Stevens described a plan of setting the wings of moths so as to give them a curved and somewhat deflexed appearance, by cutting a groove down the centre of the narrow setting-board (in which the body of the insect is lodged), and giving the sides the proper deflexed curve.

The following papers were read :—

“ On the genus *Holoparamecus* of Curtis.” By J. O. Westwood.

After detailing the history of the establishment of this genus, and its identity with the genera *Calypotibium*, *Villa*, *Amphibolonararon*,

Perro) and *Latridius*, Wallg., and the various observations made upon it by Messrs. Curtis, Aubé and Guérin-Meneville, the author shows its affinity to *Latridius* and *Myrceta*, alluding especially to the remarkable circumstance, that some of the species possess nine joints to the antennæ, another ten, and another eleven. Whereupon Mr. J. F. Stephens stated, that he had taken species of this genus on the wing at Hertford, Catterwell and South Lambeth.

Notes on the supposed Sense of Pain in Insects." By Mr. C. Bondham; of which the following is an abstract. On pinning two moths (one through both the thorax and abdomen) in the daytime, they remained immovable until their usual time of flight in the evening; whilst a peacock-butterfly pinned just before sunset was found early next morning as perfect as when left, and on removing the pin it flew away. Some beetles on being pinned at first remained for a short time inanimate, and then struggled violently as if endeavouring to escape from confinement: a specimen merely confined by a brace across the body performed the same motions. From three specimens of the common house-fly, engaged in cleaning their forefeet, he cut off one of the hind-legs, whereupon two of the insects continued the action without any signs of inconvenience, as did also the third, after moving a few inches.

Mr. C. Lamb stated that he had observed, that *Coleoptera* when stuck with a pin which is subsequently removed die shortly afterwards; but the President stated, that he had observed that the species of *Colymbetes* possess the power of repairing the injury done to the elytra by piercing them.

June 2nd.—The Rev. F. W. Hope, President, in the Chair.

Mr. Weir exhibited a fine specimen of the male of *Dorthesia Characias*, remarkable for the long white filamentous tuft at the extremity of the body.

Mr. S. Stevens exhibited living specimens of *Rhynchites cupreus* from Black Park, Bucks, and also from the north of England, taken on the flowers of the mountain ash, in company with *Molorchus minor*.

Mr. Douglas exhibited an apparently new species of *Orthotania*, recently taken amongst heath at West Wyckham.

Captain Parry exhibited a box of *Coleoptera* from China and the Himalayas, including several fine *Lucani*, and a new species of *Trictenotoma**.

The Rev. F. W. Hope brought under the notice of the meeting the destruction caused by white ants and other insects to the wooden sleepers used in the railroads in India, and reference to the kyanizing process having been made, Mr. J. F. Stephens stated, that on one occasion he had taken a number of specimens of *Thanasimus unifas-*

* *Trictenotoma tenebra*, Parry MSS. *Nigra subnitida, elytris æneis, verrucis suturam cupreis, pubescentia tenui albida oblecta, prothorace utrinque pone medium spinâ acutâ armato; mandibulis porrectis, lateribus extus subsinuatis.* Long. corp. cum mandibulis ferè unc. 3.—Hab. in India orientali prope montes Himalayanæ. Mus. Parry.—J.O.W.
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ciatus on palings at Camberwell, but that none were found on adjacent palings which had been kyanized.

The following papers were read:—

“Descriptions of two new genera of *Carabidæ*.” By J. O. Westwood.

HELLUODES, Westw. Genus novum *Helluoni* proximum, habitu vero *Morionis* cum trophis *Aniliarum*. Caput maximum (prothorace multo majus); mandibulæ porrectæ, acutæ, intus inermes; maxillæ elongatæ, apice subunguiculatæ; palpi interni valde curvati; externi maxillis vix duplo longiores; mentum in medio valde emarginatum; labium angustum, elongatum; palpi labiales articulo ultimo præcedente multo minori; prothorax truncato-cordatus, marginatus; elytra depressa; pedes mediocres; tibiis anticis intus ante apicem emarginatis; tarsorum articulo 4to simplici.

Helluodes Taprobanæ, Westw. *Niger nitidus*, labro femoribus apiceque abdominis piceo-rufis. Long. corp. lin. 15.—Hab. in Insula Taprobanæ. In Mus. D. Melly.

PLATYNODES, Westw. Genus (vel potius subgenus) novum *Morionis* proximum. Corpus magnum, latiusculum, depressum; caput magnum, planum, lævissimum, antice bi-impressum, clypeo emarginato; labrum parvum, quadratum, antice valde emarginatum; mandibulæ magnæ, intus versus medium obtuse dentatæ; maxillæ et instrumenta labialia ut in *Morione* orientali; antennæ breves, compressæ, articulis apicalibus parce setosis; pronotum capite brevius, longitudine latius; cordato-truncatum marginatum, stria tenui media impressa impressionibusque duabus ad angulos positos; elytra lata, depressa, lævia, striis paucis tenuibus impressa, costaque tenui ex humeris ferè ad apicem ducta; pedes mediocres; tarsi brevibus, ut in *Morione*.

Platynodes Westermanni, Westw. *Niger lævis subnitidus*, capite nitidissimo; labro et antennis piceis; elytris striis tenuissimis æqualibus, serieque punctorum intra margines laterales instructis. Long. corp. lin. 12 (mandibulis exclus.).—Hab. in Guinæa. Mus. Westw. A Dom. Westermanno communicatus.

An extract from a letter from Captain Boys addressed to Mr. Westwood, containing notes on the habits of the genera *Dorylus*, *Ascalaphus*, &c. was also read.

“*Dorylus*,” he states, “is certainly more closely allied to *Formica* than to *Mutilla*, as far as the little experience I have had holds good.” In a house in which Captain Boys resided at Gorruckpore, “a nest of these insects was located; and one evening they swarmed to such an extent as to become a perfect nuisance. A small orifice was discovered in the flooring (brick and earth plastered) immediately beneath the dining-table, from which hundreds were escaping. Those with wings after moving about a few seconds took flight; the apterous ones (which were no bigger than a common house-fly, or smaller), and to me appearing *true ants*, remained swarming, and entering in and out in the same manner as ants on a sunny day. This was at night. I collected a host of both kinds: I can therefore say positively that they live in society, excavate nests in the earth, and to the best of my belief are divided into neuters and workers.”

A specimen was forwarded with this communication of *Acrydium* (*Tetrix*, Latr.) *Harpago*, Serville, with the observation, that the insect is a true swimmer; the formation of its posterior legs might alone lead one to make a shrewd guess of the fact. It is found abundantly near the waterfalls at Mhow in Mulwa, frequenting the sedges on the banks of the stream. He had often seen them swim *under* water from one bank to the other, a distance of three or four yards; and they had several times tried his patience by remaining under water attached to a stone. He had constantly observed a small, silver-like bubble of air on each side of the thorax close under the base of the lengthened scutellum, and not unfrequently a third at its apex (as is seen at the caudal extremity of the *Dytisci*). They swim with rapid strokes of both posterior legs thrown out together, and at no small pace, turning as freely as a *Gyrinus* when a capture is attempted. Occasionally they will walk steadily down a reed some feet under water, and there appear to feed on the small weed which is attached to it. The steps of the bathing-ghat, from which the water had receded, being covered with the above-mentioned weed, were a fine field for them. Of their mastication of this weed he had repeated opportunities of witnessing; but they seemed to prefer that which was submerged, as they were more abundant on the steps below water except where basking in the sun.

Of a species of *Ascalaphus* remarkable for its short dilated abdomen, long and very clavate antennæ, and yellow maculated body, the writer observes that he had often found the perfect fly on tall grass knee-deep in water, whence he suspects that the larva may be aquatic. The *Ascalaphi* and *Myrmelcones* when captured emit a very offensive smell. He had obtained twelve or fourteen species of *Lucanus* from the vicinity of Almorah in the Himalayan mountains, generally found feeding upon rotten fungus, but had never taken any species in the plains. He had also captured a *Megacephala* (apparently identical with *M. cuphratica*) at Nusseerabad.

A species of *Embia* was also forwarded, with the observation that it was not uncommon; but that its habits were remarkable, as it elaborates a kind of web from the mouth under which it conceals itself. He had also captured four species of bees whose habits whilst at rest are curious, since at that time they hold on to a twig by the mandibles with the body stretched out at right angles from it, without any support from the legs, which are drawn up close to the body. Specimens of these insects were not forwarded, so that the genus cannot at present be determined.

July 7th.—The Rev. F. W. Hope, President, in the Chair.

Mr. Edward Doubleday exhibited a case of nocturnal *Lepidoptera* from Sydney, including three species of *Oiketiscus*, a new species of the genus *Doratifera* (with drawings of its preparatory states, and of which the larva stings very acutely when touched), and other new and interesting species.

Mr. Westwood exhibited two monstrosities in the male of the honey-bee, in one of which the two hind-feet were not more than a

fourth of the normal size (this being a case of retarded development), and in the other the left antenna was abbreviated with some of the joints coalescing and internally serrated.

Mr. Desvignes exhibited specimens of *Eupithecia togata*, Hubn., a species new to this country, which had been taken at Black Park, Bucks, in the middle of the preceding June. Likewise a very dark variety of *Hemerophila abruptaria*.

Mr. J. F. Stephens exhibited specimens of the rare *Anarta vidua* and *cordigera*, and *Psodos trepidaria*, recently captured by Mr. Weaver in Scotland.

Mr. Weir exhibited specimens of both sexes of *Ino globularia* from Lewes, the female being now for the first time noticed in this country.

Mr. Frend exhibited specimens of the larvæ, pupæ and imago of *Prionus coriarius*, and observed that it only requires fourteen days to pass from the first to the last of these states.

Mr. W. W. Saunders exhibited several new Australian species of Longicorn beetles allied to *Molorchus*, from Hunter's river.

Mr. Westwood exhibited a specimen of *Triclenotoma Childrenii*, and pointed out the distinctions between it and Captain Parry's new species from the Himalayas, exhibited at the present meeting. He also pointed out the peculiarities in the structure of the lower parts of the mouth of this genus, which had not been previously described.

A description of the male of *Gastroxides ater*, an Indian species of *Tabanidæ*, was read by W. W. Saunders, Esq., F.L.S. This sex differs in having the head broader than the thorax, with the eyes large and vertically contiguous, and in having a broad rufous band across the abdomen, occupying the apex of the first, the whole of the second and the base of the third joints. The female was described by Mr. Saunders in the third volume of the Transactions of the Society; and the male now described is in the collection of Colonel Hearsey.

Extracts from a letter addressed by Captain Boys to Mr. Saunders were also read, containing a notice of the locusts of India, and of a new species of *Idmais* (belonging to the *Pierideous Butterflies*).

MISCELLANEOUS.

Description of a new species of Bat from Western Africa, Pteropus Haldemani. By EDWARD HALOWELL, M.D.

GENERAL expression ferocious; head resembling that of a dog; ears of moderate size, smooth for the most part, obtuse at the tip, hairy at base externally; there is no tragus; body dark brown above; neck, occiput and vertex same colour, but lighter than upon the back; wings and interfemoral membrane of a sienna-brown colour above and below; thorax and upper part of abdomen and sides brown; the rest of the abdomen is white; there are two long and thin hairs upon the muzzle; lips full, nostrils prominent, their margins being surrounded by a fold of the skin; eyes rather large, irides —; wings long; that portion of the membrane included between the phalanges naked, the remainder more or less hairy above

and below ; upper surface of the interfemoral membrane hairy, with the exception of a small part at its posterior extremity which is naked ; under surface also hairy, but much less so than the upper ; no tail ; tibia and fibula included within the membranes ; four slender toes, compressed, of nearly equal length, the outer one being a little shorter than the others ; they are sparingly furnished with thin hairs varying in length ; the terminal phalanx of each is provided with a robust, sharp and incurvated nail. The index finger like the thumb is also furnished with a short and incurvated nail.

MEASUREMENTS.		inches.
Total length		3½
Length of head		1½
Distance between anterior margin of nostril and anterior canthus of eye	}	½ to
Distance between angle of mouth and anterior canthus of eye.....		
Length of neck, body and tail		3
Length of fore-arm		3
Length of tibia		1½
Spread		1½
Length of thumb.....		¾

Dental Formula.

Incisors.	Canines.	False Molars.	Molars.
2—2	1—1	1—1	2—2
2—2	1—1	2—2	3—3

This species I have named after my esteemed friend S. S. Haldeman, Esq., author of the 'N. American Limniades,' who obtained it with other African animals from Dr. Gohcen, Physician to the American Colonization Society.—*Silliman's American Journal*, Sept. 1846.

Description of two new species of Fossil Echinodermata from the Eocene strata of the United States. By SAMUEL GEORGE MORTON, M.D.

Cidaris alabamensis.—Compressed, pentagonal, the angles rounded so as to form a ten-sided figure. Ten rows of tubercles, with nine or ten in each row. Ambulacra arranged in five pairs, with delicate, slightly oblique fissures separated by a double elevated line. Surface between the tubercles and ambulacra finely granulated.

Galerites ? Agassii.—Elevated, hemispherical, with four pairs of ambulacra which diverge from the apex and meet at the margin, having each two rows of pores connected by transverse fissures. Surface marked by numerous distinct granulations, which are continued over the whole base of the fossil.

I have much pleasure in dedicating this remarkable species to M. Louis Agassiz, whose profound researches into this class of organized beings have thrown much new light on their structure, affinities and geological relations.

Both these fossils were found by Dr. Albert Koch in the Eocene strata of Washington Co., Alabama, and by him politely submitted to me for description.—*Silliman's American Journal*, Sept. 1846.

A new species of Apus, A. longicaudatus. By JOHN LeCONTE, F.L.S.

Pale brown : *buckler* large, thin, gibbous, nearly round, carinate on the middle of the back, deeply emarginate behind, the edges of the emargination fringed with short spines : *eyes* three, simple, the two anterior larger, approximate, somewhat lunate, the third one round, placed in the middle behind the two others : *antennæ* very short, inserted near the mandibles, two-jointed, joints cylindrical, subequal, the second joint somewhat acuminate and naked at the tip : first pair of *feet*, or as they have been called, exterior antennæ, furnished with four articulated filaments ; of these filaments, the outer one is longer than the body, the next half the length of the first, the third about one-third the length of the second, and the fourth very short : the other feet, amounting to ten pair, are flattened, trifid at the tip, the intermediate division being the longest, furnished on the inner side with a short branch, and externally with a broad lamina ; below these feet are twelve pair of laminæ, the five anterior pair larger, the seven smaller pair reaching to the vent, which is covered by the last pair ; these laminæ are complicated in their structure, and ciliate with short hairs : *tail* long, consisting of sixteen joints counting downwards from the vent, the last one the longest, somewhat coriaceous, emarginate, and ending in two long articulated naked filaments ; the joints of the tail and of the filaments are furnished each with a row of small spines, which run entirely round.

Length to the end of the tail, 1·5 of an inch ; of the buckler, ·65 ; breadth of the same, 7.

Of the habits of this animal we know but little ; it was found in immense numbers in a small shallow lake on the high plateau between Lodge-pole Creek and Crow Creek, north-east of Long's Peak, in the Rocky Mountains : they were swimming about with great activity, plunging to the bottom and rising to the surface. All of them that were caught appear to be males, at least none of them have any ova attached : the common species in Europe, *A. cancriformis*, on the contrary, has never been found but of the opposite sex.—*Silliman's American Journal*, Sept. 1846.

Structure of the Trunk of Cycas circinalis.

From the examination of some old trunks of *Cycas* received from Java, Prof. Miquel draws the following conclusions :—1. The stem of *Cycas* is composed of two sorts of elementary organs, viz. *parenchymatous cells* and *dotted vessels*, agreeing in this respect with the structure of *Conifera*. 2. In the distribution of these elementary organs, it differs greatly from that of *Conifera* : the wood is disposed in irregular concentric layers, confluent at certain points, unequal, having no relation with the buds, separated by broad layers of cellular parenchyma. 3. In the development of the tissues there are several peculiarities which are not found in *Conifera* ; for instance, in the increase of the trunk in length from the summit only, in the preponderance of parenchymatous cells, in the ligneous parts being traversed by cortical parenchyma, &c. 4. In this acrogenous growth

and by the clefts in the woody layers, there is a distant resemblance with the trunk of Ferns ; but the continuous peripheric growth is a complete distinction. 5. The structure of the trunk of *Cycas*, in all its peculiarities, more nearly resembles certain vegetables of a former epoch than of the present. The author then compares the trunk of *Cycas* with that of *Zamia* and *Encephalartos*, which have a single woody cylinder, with or without medullary rays.—*Silliman's American Journal*, Sept. 1846.

NEW WORK ON ENTOMOLOGY.

Mr. Westwood informs us that he intends commencing the publication of a new periodical work on the 1st of January, containing coloured figures and descriptions of new rare and remarkable insects, natives of India and the adjacent islands.

METEOROLOGICAL OBSERVATIONS FOR SEPT. 1846.

Chiswick.—September 1. Cloudy. 2, 3. Cloudless and hot. 4. Foggy : fine. 5. Very fine. 6. Cloudy. 7. Foggy : dusky haze. 8. Overcast. 9. Very fine. 10. Cloudy. 11—14. Very fine. 15. Slight fog : very fine. 16, 17. Exceedingly fine. 18. Cloudy. 19. Foggy : very fine. 20. Clear and dry air. 21, 22. Cloudy. 23. Heavy rain. 24. Uniformly overcast : cloudy : overcast. 25. Fine : cloudy : clear and fine. 26. Overcast : slight drizzle. 27. Cloudy and fine : rain. 28. Rain. 29. Clear and cool : rain. 30. Slight fog : cloudy : clear.

Mean temperature of the month	60°·79
Mean temperature of Sept. 1845	52 ·60
Mean temperature of Sept. for the last twenty years ...	57 ·22
Average amount of rain in Sept.	2·73 inches.

Boston.—Sept. 1—3. Fine. 4, 5. Cloudy. 6. Cloudy : rain, with thunder and lightning p.m. 7. Cloudy : 2 o'clock, thermometer 77°. 8. Cloudy. 9. Cloudy : rain p.m. 10. Cloudy. 11. Fine. 12. Cloudy. 13—15. Fine. 16, 17. Foggy. 18, 19. Fine. 20, 21. Cloudy. 22. Fine. 23. Cloudy : rain early a.m. : rain a.m. 24. Foggy. 25, 26. Cloudy. 27. Fine : rain p.m. 28. Cloudy. 29, 30. Fine.

Sandwich Manse, Orkney.—Sept. 1. Cloudy : rain. 2, 3. Cloudy. 4. Hazy : cloudy. 5. Cloudy : fog. 6. Bright : fine. 7. Bright : fog. 8. Bright : clear : aurora. 9. Bright : clear. 10. Bright : cloudy. 11. Drizzle : damp. 12. Fine : cloudy. 13. Fog : drizzle. 14. Drizzle : damp. 15. Cloudy : drizzle. 16. Rain : cloudy. 17. Clear : cloudy. 18. Bright : clear. 19. Bright : cloudy. 20. Bright : cloudy : clear. 21. Bright : clear : aurora. 22. Bright : hoar frost : clear : aurora S. 23. Bright : cloudy. 24. Rain : cloudy : fog. 25. Clear : cloudy. 26. Cloudy. 27. Clear : cloudy : aurora. 28. Clear. 29. Cloudy : rain. 30. Bright : cloudy.

Applegarth Manse, Dumfriesshire.—Sept. 1, 2. Very fine harvest day. 3. Very fine harvest day, but threatening. 4. Very fine harvest day : still cloudy. 5. Very fine harvest day. 6. Very fine harvest day : thunder. 7. Very fine harvest day. 8. Rain a.m. : cleared p.m. 9—11. Fair and fine. 12. Fair and fine : thunder. 13. Fair and fine. 14, 15. Fair and fine : fog. 16. Dull day : fog. 17. Dull and threatening : fog. 18. Still fair, but cloudy. 19. Gentle rain p.m. 20. Rain a.m. 21. Fair. 22. Fair, but dull. 23. Wet a.m. : lightning. 24. Rain. 25, 26. Showers. 27. Rain all day. 28. Showers : thunder. 29. Wet all day. 30. Fair and clear.

Mean temperature of the month	59°·6
Mean temperature of Sept. 1845	52 ·4
Mean temperature of Sept. for 23 years	53 ·0
Mean rain in Sept. for 18 years	3·25 inches.

Fig 1

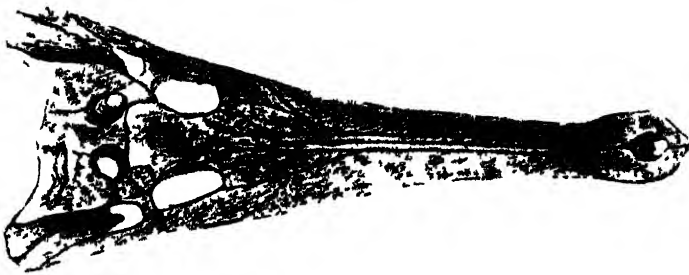


Fig 2

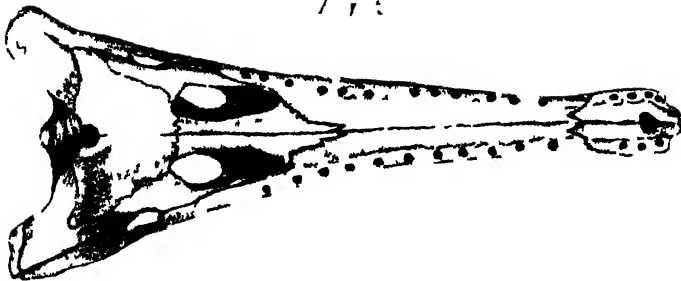


Fig 3



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Fig 1

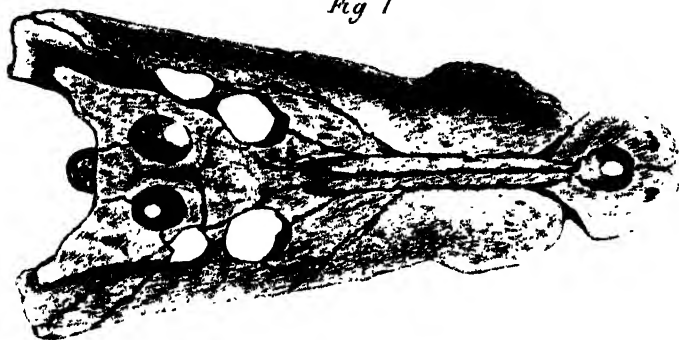


Fig 2

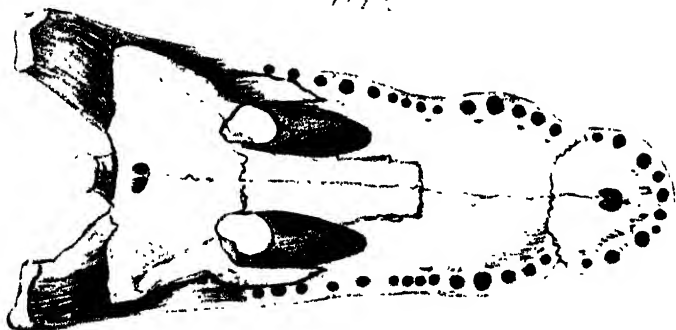
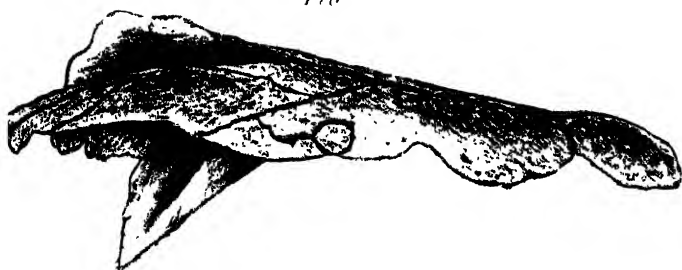


Fig 3



W. A. G. M.

CROCODILE S. M. P. G. N. L. I. D. C. C. C.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 121. DECEMBER 1846.

XXXVIII.—*Note upon two Crania of Crocodiles in the Belfast Museum**. By HUGH FALCONER, M.D., F.R.S. &c.

[With two Plates.]

THE existing Crocodiles are still but imperfectly defined, and there is little agreement among systematic authors regarding the number and characters of the species. This remark applies with especial force to the Crocodiles of the Nile and of the Ganges. Geoffroy assigns five species of true Crocodile to the Nile, all of which are considered by Cuvier as varieties of a single species, *C. vulgaris*. Dumeril and Bibron, in their 'Erpétologie,' published in 1836, follow the view taken by Cuvier, although it would appear from a verbal communication of M. Bibron, that their opinions have been considerably altered since. Mr. J. E. Gray, in his 'Synoptical Catalogue,' published in 1844, admits two species, *C. vulgaris* and *C. marginatus*. In like manner the Crocodiles proper of the Ganges were restricted to a single species by Cuvier, *C. hiporcatus*, in which view also he is followed by Dumeril and Bibron, although *C. palustris* of Lesson is inserted with doubt as a variety of *C. vulgaris* in their systematic work; but it would appear from the labels of the specimen in the Paris museum that they now recognise it as a distinct species.

* Communicated by Mr. W. Thompson, President of the Society to which the museum belongs, with the following remarks:—"The crania which form the subject of the present notice, were presented to the Natural History and Philosophical Society of Belfast by Dr. M'Cormac of that town. They were taken in the waters of the Sierra Leone river or its tributaries, and given to that gentleman by his brother, Mr. John M'Cormac of Freetown, Sierra Leone. My friend Dr. Falconer, on visiting the museum with me early in 1845, called my attention to the rarity of these crania. On leaving home for London a few months afterwards, I took the specimens with me for the purpose of comparison with others in the collections there, and the result is set forth in the paper. To the kindness of Mr. Grattan (Treasurer to the Society already named) we are indebted for drawings of the specimens made by means of a camera-lucida. These, for the sake of comparison with the figures in Cuvier's 'Ossements Fossiles,' have been drawn of the same size."

On the other hand, Mr. Gray gives three species to the Ganges, viz. *C. biporcatus*, *C. palustris* and *C. bombifrons*. It is of interest therefore to record the existence of any specimens bearing upon the disputed or ill-determined species: and having observed the crania of two rare Crocodiles in the museum at Belfast, the following notes regarding them have been drawn up at the request of Mr. W. Thompson.

Crocodilus cataphractus, Cuv. Oss. Fossiles, tom. v. p. 58. pl. 5. figs. 1 & 2; Dum. and Bibron, Erpét. tom. iii. p. 126. *C. leptorhynchus*, Bennett, Proc. Zool. Soc. 1835, p. 129. *Mecistops Bennettii* and *M. cataphractus*, Gray, Catalog. pp. 57 & 58.

This species was founded by Cuvier upon an imperfect specimen of unknown origin in the museum of the London College of Surgeons. It was briefly described by Bennett, first as a distinct species from Fernando Po in 1835, and afterwards as a variety of *C. cataphractus* in the 'Zoological Proceedings' of 1836. Mr. Gray has erected it into a separate genus under the name of *Mecistops*, in which he includes along with it the *C. Journei* of Bory de Saint-Vincent, and *C. (Garialis) Schlegelii* of Müller. So far as is known to us no representations have yet been given of the cranium divested of its integuments. Plate VI. figs. 1, 2 and 3 represent the Belfast specimen, viewed from the top, side and base of the skull. It is evidently identical with Gray's *Mecistops Bennettii*; the head of the stuffed specimen of this nominal species in the British Museum collection agreeing with it exactly in form, and very nearly in size. The muzzle is more attenuated and narrower than in *C. acutus*, but less so than in *C. Schlegelii*, which constitutes the passage from the true Crocodiles into the Garials. The cranial tablet is not so wide as in the Garial, *C. Schlegelii*, and the crotaphite foramina are proportionally smaller. The muzzle does not contract abruptly in front of the orbits, but is gradually attenuated from the back part of the cranium forwards. The extreme width at the condyles of the lower jaw is 7 inches, behind the orbits $4\frac{5}{8}$ inches, and in a line with their anterior border $3\frac{1}{2}$ inches. At the seventeenth or last tooth of the upper jaw the width is $3\frac{5}{8}$ inches, and $1\frac{5}{8}$ between the eleventh and twelfth teeth: there is an expansion to 2 inches opposite the ninth tooth, which is the largest in the head: thence the beak contracts gradually to the space between the fourth and fifth teeth, where the width is only 1 inch; at the extremity of the muzzle, between the second and third teeth, it expands to $1\frac{3}{4}$ inch. The margins, when viewed in plan, are therefore more undulated and less cylindrical than in the Garial or *C. Schlegelii*, and there is less dilatation of the point of the beak.

The orbits are much larger than the crotaphite foramina, which

are separated only by a narrow interval ; while in the Garial they are large and wide apart. The lachrymals form narrow slips of bone which descend upon the nasals a considerable way below the anterior margin of the pre-frontals. The nasal bones are extremely narrow and attenuated, but, as in the true Crocodiles, they descend between the maxillaries so as to project into a niche between the intermaxillary bones. The same holds good in *C. Schlegelii* ; whereas in the Garial the nasals terminate a short way in front of the orbits, and do not enter into the formation of the anterior portion of the beak. This character is a good diagnostic mark between the Crocodiles proper and the Garials ; separating *C. Schlegelii* from the latter subgenus under which Müller has ranged it. The nasal opening is smooth, oval in form and of moderate size. There are seventeen teeth in the upper jaw, and fifteen in the lower : the largest teeth in the upper, are the third and ninth ; in the lower, the first, fourth, tenth and eleventh.

The dimensions are subjoined at page 364.

Crocodilus marginatus (?), Geoff. Croc. d'Egypt. 165 ; Gray, Catal. Brit. Mus. p. 61. *C. vulgaris* var. *C.*, Dumer. et Bibr. Erpétolog. iii. p. 110. *C. vulgaris*, Cuv. Annal. du Mus. tom. x. 40.

The Belfast specimen is doubtfully referred to this species, there not being sufficient materials in the London museums to admit of a satisfactory determination. Neither the College of Surgeons' collection nor the British Museum is possessed of an adult cranium of the common Crocodile of the Nile, *C. vulgaris*, or of *C. marginatus*, although there are numerous stuffed specimens attributed to both species in the British Museum collection. The comparison of the Belfast specimen has in consequence been limited to the reduced figure of the skull of *C. vulgaris* in the 'Osseimens Fossiles.'

The cranium is 19 inches long, and must have belonged to an adult animal. The principal distinctive character assigned to *C. marginatus*, both by Geoffroy and by Dumeril and Bibron, in addition to the form of the nuchal and dorsal scutes, is that the borders of the cranial tablet are raised, while in *C. vulgaris* the frontal area is perfectly flat. In the Belfast cranium these lateral margins are also considerably elevated, and the following points of difference from *C. vulgaris* are besides observable. The facial portion of the head is less elongated in proportion to the cranial, and more obtuse than in *C. vulgaris* ; the interval between the orbits is greater ; the crotaphite foramina are relatively larger ; the lachrymals are narrower and descend further upon the nasals ; the muzzle is considerably blunter, and the niche for the reception of the fourth tooth of the lower jaw is larger, causing a greater

amount of constriction. The general outline of the muzzle, instead of being acute and subcuneiform, is obtuse and oblong, somewhat resembling the form of *C. palustris* of the Ganges. There is also a marked constriction behind the twelfth tooth, considerably greater than in *C. vulgaris*. The largest teeth are the third, the fourth, and the tenth, the last being the largest of all. The nasal aperture is more circular than in *C. vulgaris*. There is no lower jaw to the Belfast specimen. Plate VII. figs. 1, 2 and 3 represent the cranium, viewed from the top, side and palate, as in *C. cataphractus*.

The dimensions of the cranium are as follow:—

DIMENSIONS.	<i>C. cataphractus.</i>		<i>C. marginatus.</i>	
	inches.		inches.	
Length of cranium from the point of the muzzle to the occipital ridge	}	15·5	}	16
Length of cranium from the point of the muzzle measured to the condyle of the upper jaw				
Extreme width of cranium at the condyles		7		8·5
Length from occipital ridge to base of nasals		6		6·7
Length from the point of the muzzle to base of nasals	}	9	}	10·7
Length of orbit				
Width of orbit		1·8		2·7
Interval between orbits		1·4		2
Antero-posterior diameter of crotaphite foramen ...		·8		1·5
Transverse diameter of crotaphite foramen		1·1		1·9
Width of the muzzle at the last tooth		·8		1·4
Width of the muzzle at base of the nasals.....				6·7
Width at contraction behind the twelfth tooth		2·8		6·5
Width at the tenth tooth.....				4·8
Width at the ninth tooth.....				6·8
Width at contraction behind the fourth tooth		2		
Greatest contraction behind fifth tooth		1·1		
Dilatation of the point of the muzzle				2·9
Length of the nasal aperture		1·8		4·3
Width of the nasal aperture		·9		2
Length of intermaxillaries on the palate		·75		1·8
Length of maxillaries on the palate		3		3·9
Antero-posterior diameter of palatine foramen		6·3		4·1
Transverse diameter of palatine foramen				4·7
				1·9

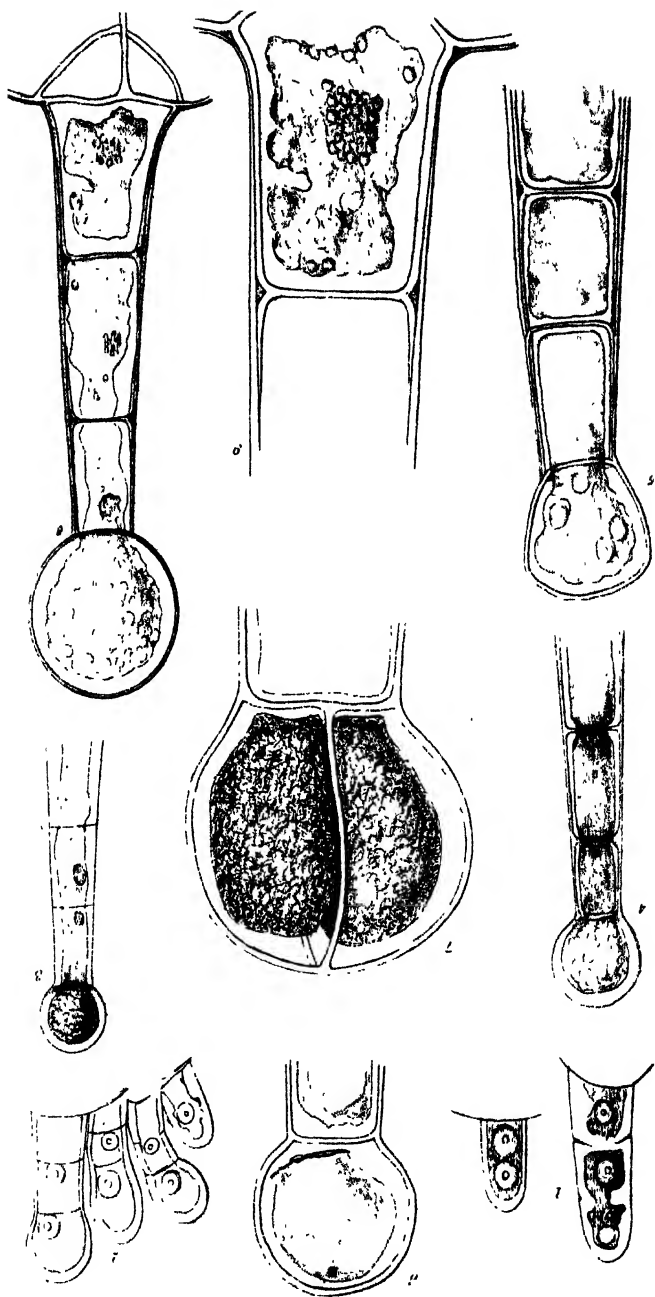
XXXIX.—On the Development of Vegetable Cells.

By ARTHUR HENFREY, F.L.S. *

[With a Plate.]

IN some observations which I had the honour to lay before this Section at Cambridge last year, I brought forward certain views I had adopted in regard to the multiplication of vegetable cells by division, which I then stated to be to a certain extent hypothetical,

* Read before the British Association, Southampton, Sept. 1846, and communicated by the Author.



that is to say, they were rather the only probable explanation of the phenomena I had observed, than conclusions from an unbroken series of examinations of the process in its successive stages.

I then gave it as my opinion, that the division of the parent-cell into new cells is effected by the gradual folding inward of the primordial utricle, which organ, in virtue of its peculiar function, secretes the septum within that fold; the circular constriction thus produced arriving finally at the centre, the septum consisting of a double layer of cell-membrane becomes complete.

It is chiefly with the view of confirming and substantiating this opinion, and of supporting it by a reference to the evidence in its favour which has since been furnished by other and independent observers, that I have been induced to submit the present remarks to your consideration.

It may be remembered that I acknowledged last year that my investigations had been directed in the channel which led to the conclusions at which I had arrived by the elaborate observations on the primordial utricle published by its discoverer Prof. Mohl.

Toward the close of last year I was not a little gratified to find that the further researches he had instituted into the office of this structure had led him to adopt precisely the same view of the process of cell-division in certain plants which I had ventured to propound as of general occurrence.

In the memoir on the Structure of Vegetable Cells*, in which he first described the primordial utricle, Prof. Mohl stated that, in the *Confervæ*, this organ in cell-division became constricted by a septum growing inward from the walls which finally separated it into two; but at that time he thought it probable that this was a process totally different from that which took place in the *Phanerogamia*, where he believed that the primordial utricle separated into two before the production of the septum commenced.

In a paper on the division of the cells of *Confervæ*, published in 1835, before the discovery of the primordial utricle, Prof. Mohl affirmed that the septum grew inward directly from the cell-wall and thus divided the cell into two. In the collected edition of his memoirs published last year, he has re-written this latter paper, correcting it in several important particulars in consequence of a new series of observations he was induced to undertake to investigate the theory of cell-development advocated by Nägeli.

He there describes and figures the process of cell-division in *Conferva glomerata*, and shows the production of the septum by the primordial utricle exactly in the manner which I had indicated as occurring in the hairs of the stamens of *Tradescantia*.

* Translated in Taylor's Scientific Memoirs, Part XIII. p. 91.

M. Müller, in his researches upon the development of *Chara**, declares that cell-formation is effected by two different and apparently very distinct processes.

Some of the cells, he says, are produced from cytoblasts in the manner described by Schleiden, from whom, however, he differs in some respects, since he regards the membrane developed from the cytoblast as identical with Mohl's primordial utricle, and therefore not as the permanent cell-wall.

In other cells multiplication takes place by division, and the figures in which he represents the condition of the primordial utricle in various stages of its division, agree perfectly with the appearances observed by Prof. Mohl and myself.

With respect to the production of cells from cytoblasts, I do not think the evidence he has offered conclusive; one of his figures indeed, which he owns that he cannot explain, rather inclines me to believe, not that the cytoblasts are the efficient causes of the development of new cells, but that their presence in certain cases of multiplication of cells by division, has led Müller, like Schleiden and others, to a misconception of their function.

I will not venture an opinion as to the real function of the cytoblast, but this much I may state, that it is generally present at a very early period of cell-life, and usually of the full size. Now cell-division often takes place, or rather commences at an epoch when the cytoblast completely fills that portion of the primordial utricle, which is about to form a new cell; on the subsequent expansion of the utricle its walls retreat from the periphery of the cytoblast or nucleus which then remains suspended in the cavity or attached to the wall. This may be observed in the moniliform hairs of *Tradescantia*.

It is evident that we have here an appearance simulating the development of membrane from a cytoblast as described by Schleiden; and since I have never been able to see the production of cytoblasts themselves by the aggregation of the granules of the mucilage, I think it most probable that it has been a misinterpretation of similar phenomena which has given rise to Schleiden's theory.

Müller has represented a cytoblast or nucleus cut into two portions by the fold of the primordial utricle.

The same division of the perfect nucleus by the septum of the cell has been observed by Unger. This is a different thing from the original division of the nuclei which is said to occur at the earliest epoch of the life of the cell, but it is direct evidence against the assumption that the cytoblast is the active agent in the production of the new membrane.

* See Ann. Nat. Hist. vol. xvii. p. 251, &c.

One thing at least is certain, that the cytoblast has nothing to do with the production of the permanent cell-wall, since it is always within the primordial utricle, either adhering to its walls or at earlier periods suspended in the cavity by mucilaginous filaments.

In the course of my investigations to satisfy myself of the correctness of the view I had taken of the agency exercised by the primordial utricle in cell-division, I have observed the process in several plants, Cryptogamous and Phanerogamous. In no case have I been able to trace the gradual progress of the formation of septa so well as in *Achimenes grandiflora*. This plant produces a great number of axillary buds or bulbels, on the scales of which are found many capitate hairs. I examined these hairs in young buds of from about half a line to a line in length, possessing at that period only six or seven scales. By dissection these scales were isolated and brought under the microscope; the hairs which fringed the margin of the scales were thus presented free throughout their whole length, and being very transparent afforded an admirable opportunity of examining the cells in their different stages in a perfect and uninjured condition—an important point which cannot be secured in sections of growing tissues.

In the earliest stage represented in the plate, the nuclei were perfect and distinct one from another; in the next, the transverse lines indicate the commencement of the infolding of the primordial utricle; that the lines are not septa is seen by the appearance of hairs which had been kept in spirit several days; in these, the primordial utricle, detached from the lateral walls, is continuous throughout the whole length of the hair.

Different stages of the infolding, that is, the progress of the fold toward the centre, are shown by the constrictions exhibited by the coloured mucilaginous cell-contents. In the specimen treated with iodine, Pl. VIII. fig. 8, the septa are incomplete in the upper part of the hair, but the lowest septum is perfect, the primordial utricle with the cell-contents having become retracted from it. In this septum, the two new layers may be traced from the lateral walls, intimately united toward the centre so as to appear like one layer. This example also shows that the layers forming the septum are continuous with a new layer deposited over the inside of the lateral wall. Mohl states that each layer of new matter grows from the circumference to the centre, and that the septum is not produced by a succession of layers each projecting a little beyond that preceding it. This point I have not yet been able to determine for myself. In the perfect cell, the primordial utricle with the nucleus undergoes dissolution.

These views, which I have adopted of the nature of the process

of multiplication by division, are not sufficient to explain all cases of cell-development,—I allude particularly to the production of free cells in the cavity of a parent-cell, such as occurs in the formation of spores and pollen. Supposing that this is not effected in the way described by Schleiden, namely by development from nuclei, it is necessary to suppose either with Nägeli that the primordial utricle divides into distinct portions and becomes detached from the cell-wall before it begins to secrete membrane, or that the new cells formed within the parent-cell in a manner represented in the figures, subsequently become free by the solution of those layers of membrane deposited immediately upon the primary wall.

This is a subject of considerable difficulty, especially as an internal formation, such as is implied in all these theories, throws no light upon the external markings which are produced in definite arrangements or pollen grains, spores, &c. These points remain for future investigation.

EXPLANATION OF PLATE VIII.

Fig. 1. Very young capitate hairs from the scales of the buds of *Achimenes grandiflora*; treated with iodine.

Fig. 2. Somewhat older specimens.

Figs. 3, 4. Older specimens exhibiting the continuation of the primordial utricle through the whole length; kept in spirit some days.

Figs. 5, 6, 7, 8. Specimens where some of the septa are incomplete, others perfect; treated with iodine.

Fig. 9. The lower part of fig. 8. more highly magnified, exhibiting the new internal membrane.

XL.—Notice of a Surf Scoter, *Oidemia perspicillata*, Linn. (sp.), obtained on the coast of Ireland. By WILLIAM THOMPSON, Pres. Nat. Hist. and Philos. Society of Belfast.

A BEAUTIFUL adult male bird of this species was shot at Ballyholme, Belfast Bay, on the 9th of September 1846, by Snowden Corken, Esq. It was alone, about two hundred yards from the shore, allowed three shots to be fired at it before attempting to dive, and was killed at the fourth or fifth shot, on reaching the surface after having dived*. Two birds of this species had a day or two before been observed in company in the same locality, and one was seen several times in the course of a few weeks after the subject of this notice had been killed. "The weight of the specimen was 1 lb. 14 oz.; its length 21 inches; wing from carpus

* Audubon remarks, that "it is an uncommonly shy bird, and therefore difficult to be obtained, unless shot at while on wing, or when asleep, and as it were at anchor on our bays, or near the shore, for it dives as suddenly as the Velvet and Scoter Ducks, eluding even the best percussion-locked guns."—Orn. Biog. vol. iv. p. 163.

to point of quills 9 inches 2 lines ; tarsus 1 inch 6 lines ; middle toe and nail 2 inches 8 lines ; breadth across the wings 27 inches," as noted during my absence from home by Dr. J. D. Marshall, but for whose kindness, and the considerate attention of Mr. Darragh (Curator of the Belfast Museum), I might not have had the opportunity of seeing the bird, and certainly could not have known the kind of food which it procured on our coast, or the form of its trachea. The contents of the stomach, preserved for my inspection, consisted of ten perfect specimens of *Nucula margaritacea*, from small to adult size, and a portion of the shell of a very large *Solen pellucidus*, with fragments of the shells of other species. The bay where this bird was shot is of a sandy nature, such as Wilson remarks is frequented by the species on the coast of North America. The only Mollusca that he particularises as its food is "spoutfish" (*Solen*), one of which was found in the present specimen: this and "small bivalve shell-fish," he remarks, are its principal food. As the species of *Nucula* mentioned is generally dredged in from three to five fathoms (18—30 feet) water in Ballyholme Bay, we must suppose that the bird dived to that depth to obtain these shell-fish:—a supposition in accordance with Audubon's remark, that this species "is frequently observed fishing at the depth of several fathoms."

All the general descriptions of the colours of the Surf Scoter sufficiently mark the species, but none that I had read gave me a proper idea of the beauty of the head and bill—more especially of the latter—as exhibited in the bird before me. Its entire plumage is of a rich black colour with a reddish violet reflection, excepting the pure white marking in front of the head between the eyes, and that of the same colour extending down the nape. The former is heart-shaped, $1\frac{1}{4}$ inch in length, and the same in breadth ; the latter occupies $2\frac{3}{4}$ inches in length, is 10 lines in breadth at the top, and gradually narrows downwards to a point. The irides are pure white. A peculiar and handsome feature is presented in the plumage advancing so far down the ridge of the bill as to be half-way between its lateral base and the tip, and in a vertical line with the nostrils. The whole of the elevated portion of the upper mandible next the frontal base is of a carmine-red shading into rich yellowish orange, which occupies the portion from the nostrils forward to the unguis, this being of a paler shade of the latter colour. The anterior half of the space between the nostrils and the lateral base of the bill is white of a pearly lustre ; the posterior half chiefly occupied by a nearly square black spot (7 lines in diameter) in a "setting" as it were, of three colours ;—the portion of the mandible between it and the lateral base (a line in breadth) being carmine-red ; that above it gamboge-yellow ; below it white, of a pearly lustre as it is an-

teriorly. Under mandible white, except towards the nail, where it is orange; nail a mixture of white and brownish orange. Legs and toes deep red, inclining a little to orange, and blotched more or less with black; this latter being the colour of the webs and nails, with the exception of one nail, which is white.

A very full description of the trachea of the Surf Scoter, with measurements of the different portions, is given by Audubon (vol. iv. p. 166), who correctly remarks, that it presents the same structure as that of the Velvet Duck (*Oid. fusca*).

The *specific* differences however seem to me worthy of being figured—which in so far as I am aware has not yet been done—and for that purpose I have made a drawing of the trachea of the present specimen. This, for the sake of comparison with that of the Velvet Duck figured by Yarrell, has been drawn on the same scale. It will be seen from my figure, that the Surf Scoter, as well as the species just named, exhibits within the upper expansion of the trachea “an aperture on each side,” &c., as particularly noticed in the case of the Velvet Duck by Mr. Yarrell (B. B. vol. iii. p. 219, 1st edit., or p. 316, 2nd edit.).

	in.	lin.
Length of trachea of Surf Scoter (see figure) } from <i>a</i> to <i>a</i>	7	0
Breadth of trachea at <i>b</i>	0	9
Length of enlargement marked <i>c</i>	1	0
Breadth of enlargement marked <i>c</i>	1	2
Length from the base of the lower enlarge- ment to the origin of the two inferior tubes } —marked <i>d</i>	0	9
Length of fleshy process marked <i>e</i>	0	3
Length of fleshy process marked <i>f</i>	0	11



Although the *peculiar* form of the trachea, as well as the external characters, generally place this species next to the Velvet Scoter, yet in the form of the bill the two species differ very considerably. This difference has been admirably pointed out by Mr. Selby in the following words:—“ In this species [*Oid. perspicillata*] the bill has not that flatness and expansion in front of the nostrils that are so conspicuous in *Oid. nigra* and *Oid. fusca*, but assumes, in a great degree, the characters of the succeeding genus *Somateria* (Eider), by the tip being suddenly contracted, and the nail (which is also more convex than in the other species) being brought to a narrow rounded point; the entering angle of the forehead also projects, as in the common Eider, as far as the nostrils. The lateral parts of the bill at the base are very tumid, and are particular from the marking there displayed, these swellings being entirely exposed, and not in part concealed

by the feathers, as in the Velvet Scoter*." The highly arched form of the bill above the nostrils requires however especial notice†. In the absence of a figure, some idea may perhaps be given by the following two notes of its depth :—

	in.	lin.
Depth of bill at base of ridge where plumage terminates—	0	10½
16 lines from tip		
Depth of bill at 10 lines from tip.....	0	3
Length of bill above (not following curve)	1	4
Length of bill to rictus	2	6
Length of bill to base of lateral protuberances	2	4
Breadth of bill between the lateral protuberances	1	4

The specimen which has furnished the subject of this communication was in course of being preserved for Dr. Charles Cupples of Lisburn, who on being informed of its rarity most liberally presented it to the Belfast Museum.

The Surf Scoter is known only as a British species from its having been obtained at the Orkney and Shetland Islands, with the exception of one individual, recorded by Mr. Gould as obtained in the Firth of Forth, and "a recently shot one sent to Mr. Bartlett for preservation," as noticed in Yarrell's work, vol. iii. p. 322, 2nd edit., but the locality where it was killed is not mentioned—the "Naturalist, vol. iii. p. 420," is referred to for the original notice of this specimen.

Wilson (briefly) and Audubon (very fully) give interesting descriptions of the habits, &c. of this species, which is common on the North American coast, increasing in numbers northward.

XII.—*Descriptions of new or imperfectly described Diurnal Lepidoptera*. By EDWARD DOUBLEDAY, Esq., Assistant in the Zoological Department of the British Museum, F.L.S. &c.

[Continued from vol. xvii. p. 26.]

Fam. PAPILIONIDÆ.

Genus PAPILIO.

Pap. Anticrates. *Pap.* alis anticis trigonis, posticis caudatis, omnibus albis, marginibus externis nigris, anticarum linea transversa, interrupta alba, posticarum lunulis sex albis notatis, anticis fasciis quinque, posticis duabus nigris. Exp. alar. 3 unc. vel 75 mill.

Hab. Silhet.

Above, wings white, with a broad black border along the outer

* Illust. Brit. Orn. vol. ii. p. 335.

† Yarrell's figure of this species is admirable, with the single exception of the peculiar form of the bill not being represented. The arched profile of the upper mandible in the specimen under consideration (probably from its being a very old male) is still more strongly marked than in Mr. Selby's figure, representing a male bird of life size.

margin, this border divided on the anterior wings by a white line interrupted by the nervules, commencing below the second median nervule and extending nearly to the anal angle; on the posterior by a series of six lunules; anterior wings black at the base, crossed immediately beyond the base by a transverse band, followed by another directed rather more outwardly; another broader band crosses the cell about its middle, sometimes extending beyond the median nervule; a fourth band crosses the cell between this and its termination, where there is a fifth; neither of these extends below the median nervule. Posterior wings tailed, with two transverse bands near the base, of which one is nearly continuous with the first band of the anterior wings; the second, often almost macular, sometimes nearly wanting, commences a little within the second band of the anterior wing, its outer edge being nearly continuous with the inner edge of the band of the anterior wings, traverses the wing outside the cell, and at its termination curves round so as to reach the end of the first fascia, and is here marked with two grayish lunules; on the abdominal margin, near the anal angle, is a small pale spot, and the black border is here powdered with gray. Tails black, edged with white.

Below, all the markings nearly as above, but of a pale brown; the white lunules of the posterior wings are edged with black; the second band composed first of a brown fascia, then a series of seven or eight red spots, bordered with black.

Head black, with two white lines in front; antennæ black.

Thorax black above, with two pale lateral lines; below gray.

Abdomen black above, gray below, the sides with the margins of the segments pale.

In the collections of the British Museum and W. W. Saunders, Esq.

This species is closely allied to *P. Nomius* of Esper, but may be known by its smaller size, the line in the black border of the anterior wings instead of a series of dots, and some other characters.

Pap. Leosthenes. Pap. alis anticis trigonis, posticis caudatis, omnibus albidis, marginibus externis nigris, anticarum lineâ, posticarum lunulis sex albidis notatis; anticis fasciis transversis quatuor, posticis duabus nigris. Exp. alar. $2\frac{1}{2}$ unc. vel 64 mill.

Hab. Australia.

Above, anterior wings whitish, slightly tinged at the base with greenish, the outer margin broadly fuscous black, divided by a whitish line extending from the second median nervule nearly to the anal angle; near the base are two transverse fuscous bands, continued across the posterior wings beyond the middle; a third

band crosses the middle of the cell, extending beyond the median nervure; a fourth covers the end of the cell, nearly touching the black border. Posterior wings tailed, with a broad fuscous black margin marked with a series of whitish lunules between the nervules, less defined towards the anal angle, where they are margined with bluish, the abdominal margin black; the terminations of the two transverse bands marked by four yellowish lunules, bordered with black, of which two are placed outside the second band, two between these and the abdominal margin; tails black, bordered with whitish.

Below, all the wings with the markings nearly as above, but there is an indication of a second pale line in the dark margin of the anterior wings, and on the posterior wings two additional red lunules outside the second band near the costa.

Head brown, white anteriorly; antennæ black.

Thorax brown above, with two white lines anteriorly, below grayish white.

Abdomen fuscous above, grayish white below.

In the collections of the British Museum, H. G. Harrington, Esq. and W. W. Saunders, Esq.

This species represents in Australia *P. Nomius*, *P. Podalirius*, and their allies.

Pap. Branchus. Pap. antennis brevibus, alis omnibus nigris, anticis supra macula discoidali albida, posticis fascia rufa, subtus posticis maculis quatuor basalibus, lineaque marginis interni coccineis. ♀ Exp. alar. $3\frac{1}{2}$ unc. vel 85 mill.

Hab. Honduras.

Above, anterior wings black, the disc with a large whitish spot divided by the median nervure, below which is a spot composed of scattered whitish scales, outer edge with indistinct whitish spots between the nervules. Posterior wings dentate, crossed beyond the cell by a broad band composed of six spots of a dull crimson, externally paler and tinged with buff, the first roundish, the second, third, fourth and fifth somewhat wedge-shaped, the sixth nearly square; outer margin dentate, cilia between the teeth whitish.

Below, anterior wings as above; the posterior wings with four spots at the base and a line along the abdominal margin bright crimson; the transverse band paler than above.

Head black, with two red spots behind; antennæ short, black.

Thorax black, spotted with red below; prothorax with two red spots above.

Abdomen black, with two lateral red spots at the base.

In the collection of the British Museum.

This species is closely allied in form to *P. Ilus*, but is at once

known by the different position and form of the white spot on the anterior wings and the broader, differently coloured band of the posterior. Its short antennæ also are a good distinguishing character, giving somewhat the appearance of a *Parnassius*.

Pap. Harmodius. Pap. alis anticis subelongatis, posticis dentatis, caudatis; omnibus supra nigro, olivaceo-nitentibus, macula magna marginis interni alba, posticis maculis quinque chermesinis. ♀ Exp. alar. $3\frac{1}{2}$ unc. vel 90 mill.

Hab. Bolivia (Mr. Bridges).

Above, anterior wings fuscous black, with bright olive-green reflections, marked with a large white spot below the cell, divided into two unequal parts by the first median nervule, and slightly crossing the radial nervule, not extending either to the cell or the inner margin. Cilia white, except at the apex and the ends of the nervules, where they are black. Posterior wings black, with olivaceous reflections, crossed considerably beyond the middle by a band composed of five crimson spots, the first rounded, the second smaller, somewhat oval; third oval, much larger, rather truncate externally; fourth oval, rather smaller than the third; fifth quadrate; between this band and the margin one or two small faint whitish clouds. Cilia white, except at the end of the teeth.

Below, all the wings paler than above, without any olive lustre; the spots of the posterior wings pale, darker externally; the base of the anterior wings marked on the costa with a brilliant carmine spot, the cell with four black longitudinal vittæ, the white spot as above; base of posterior wings with three crimson spots, one on the costa, one in the cell, the third below the median nervule. Cell with three black longitudinal vittæ.

Head black, with two whitish lines in front and two spots of the same colour on the vertex.

Thorax black, spotted with white above.

Abdomen black, the sides spotted with white.

In the cabinet of the British Museum.

Closely allied to *P. Itus*, but easily distinguished by the different position and form of the white markings on the anterior wings, the want of the crimson in the discoidal cell below, and other less obvious characters.

Pap. Pharnaces. Pap. alis omnibus nigris, purpureo-nitentibus, posticis dentatis, caudatis; serie duplici macularum rubrarum, marginis ipso albo notato. Exp. alar. $4\frac{3}{4}$ unc. vel 120 mill.

Hab. America Merid.

Above, anterior wings fuscous black, paler beyond the middle, with slight purple reflections, the outer margin sinuate, slightly edged with white in the sinuosities. Posterior wings dentate,

with a short obtuse tail, black, with bright purple reflections, marked beyond the middle with three somewhat cuneiform roseate spots, one in face of the cell, two between the median nervules, between these and the margin four sub-lunulate spots; anal angle with a spot of a more rufous hue, above which are three small groups of rosy atoms. Below, browner than above, the posterior wings with a series of rufous lunules beyond the middle, all resting on a black cloud, the one on the costa white externally, the next very faint; a second series between these and the outer margin all edged with white, the white spots on the edge larger than above.

Head and thorax black, spotted with red.

Abdomen black, with a red spot at the base.

In the collection of Conrad Loddiges, Esq.

Pap. Isidorus. Pap. alis anticis elongatis nigris, posticis dentatis subcaudatis, maculis quatuor rufis, margine ipso albo maculato.

Exp. alar. $3\frac{3}{4}$ unc. vel 95 mill.

Hab. Bolivia (Mr. Bridges).

Above, anterior fuscous black, inclining to brown, the cilia spotted with white; posterior wings dentate, subcaudate, darker than the anterior, marked with two large red spots between the median nervules, preceded and followed by a smaller one; margin itself and cilia between the nervules white.

Below, paler than above; the anterior wings with a large white spot, divided by the median nervure and its nervules; posterior wings with two rather large pinkish white spots between the median nervules, preceded by a series of four red smaller ones, surmounted each by a faint red cloud and followed by two round spots on the abdominal margin; margin and cilia as above.

Head black, with two white lines in front and two white spots on the vertex.

Thorax black, with four red spots above and six below.

Abdomen brownish, with a red spot on each side at the base.

In the collection of the British Museum.

Allied to *P. Anchisiades*, but the anterior wings are entirely of a black brown above, and below have the white spot placed much nearer the middle of the wing. The posterior wings have far less red than those of *P. Anchisiades* and *Idæus*, which they somewhat resemble, especially below; they are moreover much more acutely dentate.

Pap. Madyes. Pap. alis omnibus supra cupreo-virescentibus, anticis fascia maculari, posticis lunulis quinque pallidis, subtus anticis nigris, æneo-nitentibus, apice late flavido, posticis flavidis nervis nervulisque nigris; fascia pone medium nigra, maculis argenteo-

albis notata; serieque marginali lunularum argenteo-albarum.

Exp. alar. 4 unc. vel 102 mill.

Hab. Bolivia (Mr. Bridges).

Above, all the wings coppery-green, inclining to olivaceous; the anterior with a transverse curved macular yellowish band, commencing a little below the costa, beyond the cell, and terminating near the anal angle; between it and the apex three rounded spots of the same colour, and the faint indication of two similar spots within it, between the median nervules. Cilia spotted with white. Posterior wings with a series of greenish yellow lunules near the hinder margin. Cilia between the teeth white.

Below, the anterior wings are black, with green reflection; the apex and outer margin occupied by a broad band of a dull greenish yellow, narrower and macular towards the anal angle; the outer margin very narrowly fuscous, except at the anal angle, where the margin is broader; the cell with two slender whitish lines towards the base. Posterior wings dull greenish yellow; the nervules and a Y-shaped vitta in the cell black; a black band traverses the wing beyond the cell, marked with a series of silvery-white spots between the nervules, all of which are geminate except the first and last. On the margin itself a series of white lunules, bordered internally with black, shading to purplish and green, the black prolonged nearly to the transverse band. Cilia between the teeth white.

Head black, spotted with white.

Thorax bronzy black above; sides yellowish.

Abdomen bronzy green above, yellow at the sides, black, spotted with white below.

In the collection of the British Museum.

Allied to *P. Archidamus*, but easily distinguished by the character given above.

XLII.—*On the Wound of the Ferret, with Observations on the Instincts of Animals.* By ANDREW BUCHANAN, M.D., Professor of the Institutes of Medicine, University of Glasgow *.

HAVING often heard of the remarkable way in which the Ferret destroys its victims, I willingly availed myself of an opportunity presented to me on the 26th of August last (1845), of seeing two rats killed by this animal. I found the common account quite correct, that the Ferret kills by means of a small wound in the neck; but the explanation usually annexed I found quite erroneous, that the Ferret aims at the jugular vein, and destroys life

* Read before the Philosophical Society of Glasgow, and communicated by the Author.

by sucking the blood of its victim. The rapidity of the death was quite inconsistent with so tedious a process as blood-sucking, and the dissection showed the true cause to be totally different, and so very curious, that I have thought it not unworthy of the notice of the physiological section of the Society.

The two rats being put into a large barrel, concealed themselves under some hay in the bottom of it. On the Ferret being introduced, it seemed dazzled with the sunshine, for it took no notice of one of the rats placed right before it; but soon finding the scent, it burrowed under the hay, taking the very track which the rat had just taken, and thus came round directly upon him. The rat, which was of large size, resisted stoutly, but the Ferret, instead of returning the bites it received, seemed entirely occupied with putting itself into a proper position, applying itself to the body of its antagonist, breast to breast, and using the fore paws and head, as if going to embrace it. No sooner had it assumed this position, than it inflicted a wound, which was so instantaneously fatal, that a physiologist might have guessed from that circumstance alone, what the nature of the wound must have been. The rat died without a struggle: and the Ferret immediately disengaged itself from the body, instead of remaining to suck the blood, and soon falling on the track of the other rat, destroyed it exactly in the same manner.

I now proceeded to examine the dead animals. Neither of them exhibited any marks of injury inflicted by the Ferret, except a bloody patch on the side of the neck, under the ear. In the first one which I looked at, there was at the upper part of this bloody patch, or a little below and behind the ear, a very small punctured wound, and on dissecting it carefully to the bottom, I was surprised to find that the sharp dens caninus, by one of which the wound was obviously inflicted, had gone right down to the spinal cord, piercing it between the occiput and the uppermost cervical vertebra. The Ferret therefore destroys its victims by pithing, a process well-known to be the most immediately fatal, to the upper orders of vertebrated animals, of all modes of destroying life: and it employs for the purpose one of its long slender dagger-like tusks, a weapon singularly well adapted to inflict a wound which proves fatal, neither by laceration nor contusion, but by penetrating into the very centre of the nervous system, on which the most important functions of life immediately depend.

The death of the other rat was obviously produced in the same way; but there was no external wound visible on any part of the bloody patch on the neck, the tusk having been inserted into the external ear, and then penetrating the cartilaginous side of the auditory passage had been carried towards the vertebral canal,

which it entered under the occiput, more laterally than in the former case.

It is certainly very remarkable, that instinct, or the promptings of bodily organization, should lead an irrational creature to use its weapons in the very way in which a profound knowledge of the functions of the nervous system teaches that they may be used with the most deadly and instantaneous effect. The cerebro-spinal axis, or great central nervous column, lodged in the elongated cavity of the head and spine, cannot be wounded at any point without interfering more or less with sensation and motion; but the part of this nervous column, on the integrity of which the continuance of life immediately depends, is the medulla oblongata, or part of the column lying intermediate between the head and spine. Wound an animal below this point, and you paralyse his limbs more or less, but life may be protracted for years after such injuries. Wound the animal above this point, and you not only produce palsy, but impair or destroy consciousness and the faculties of the mind. Still, however, just as we see in a man struck down by a fit of apoplexy, the action of the heart and the respiration may go on little or not at all affected. It is on the upper part of the cord that these important functions immediately depend, and hence it is that to the higher vertebrata, a wound inflicted there is the most instantaneously mortal of all wounds, at once destroying consciousness, sense and motion, and arresting the action of the heart and respiratory muscles. It is not a little remarkable that the Ferret should select this very part of the cord into which to thrust his tusk; and serves to show how the promptings of instinct may anticipate the deductions of science.

To those who love to speculate on the mental endowments of brutes, it may not be uninteresting to know how two young Ferrets that had never before seen a rat killed, deported themselves on the occasion. Before putting the old Ferret into the barrel where the rats were, a trial was made with two young ones, her offspring. The untutored creatures, instead of having for their single object to put themselves into the proper position to inflict the death-wound, engaged in conflict with the rats, returning bite for bite; and, although one of the rats had its leg bitten through, they at length beat off their assailants. Still further, after the old Ferret had despatched the first rat, one of the young ones immediately threw itself upon the dead body, assuming the very position and motions which the old one had assumed, and so far as could be judged from there being but one wound, thrusting its tusk into the very same aperture. Did then the young Ferret receive a lesson from the old one? The facts do not at all accord with this hypothesis, for the young one, instead of attending to

the lesson given it, was all the while engaged in skirmishing with the other rat. Besides, the headlong fury with which the young animal threw itself upon the dead body had nothing in it of the caution of an experimental and intellectual act, but partook altogether of the character of a blind impulse—an intense feeling of bodily gratification, impelling the creature to the act which it performed.

The acts which we name instinctive, appear to me to be best explained upon the hypothesis that they proceed from the promptings of bodily organization. The bodily organs of animals are formed in a certain way to adapt them to the performance of certain acts, which acts the animals perform readily and with pleasure to themselves: other acts to which their organs are not adapted, they cannot perform at all, or not without a painful constraint, and therefore they do not perform such acts. One animal goes to sleep stretched upon the ground, finding that to be the position in which there is the most complete repose of the muscular system; another supports itself on one leg, upon a spar, a position which the former animal could not maintain, without the most painful efforts, for more than a few seconds. That position, however, is admirably adapted to the organization of birds, their bodies maintaining their equilibrium in perfect security, and without muscular exertion, by a mechanism which Borelli has explained. According to the same law of the adaptation of organs birds fly, fish swim, quadrupeds walk and run, and every animal uses its weapons, offensive and defensive, in the way in which the Author of nature meant them to be used. This physiological theory of instinct seems to me more probable than that which refers it to innate ideas, or any other peculiarity of mental constitution; or than the extraordinary hypothesis of Lord Brougham*, who refers all instinctive acts to the immediate inspiration of the Deity—the divine mind supplying the place of reason and directing the bodily organs. This is exactly the doctrine of Pope, and with deference to so great a man, seems to me to savour more of poetry than of philosophy.

“Reason exalt o’er instinct as you can,
In this ’t is God directs, in that ’t is man.”

It is commonly said that instinct is independent of all reasoning, education and experience; and it has been assumed as a character of the instinctive acts, that they are performed as perfectly at the first as at any subsequent time. This holds good only among the lowest animals, whose whole actions are automatic, or without any intervention of the reasoning power; but it is so far from being universally true, that it may be affirmed, that in all

* Dissertations on Subjects connected with Natural Theology.

animals capable of reasoning, the instinctive acts are under the control of the reasoning power, and are frequently not performed aright at the first, as in the case of the young Ferrets above-mentioned. The ultimate result, however, of the reasoning process in such cases cannot be doubtful, since the bodily organization operating upon the mind will admit of only one conclusion; and hence, even in the highest species of animals, these instinctive acts are always ultimately performed exactly in the same way.

The instinctive acts which excite our wonder most are such as those we observe among the insect tribes, in which the intervention of reason cannot be suspected, and which are, on that account, the better fitted to elucidate the true nature of instinct. But the wonder with which we regard the workmanship of insects proceeds mainly from an erroneous view of the directing power by which it is carried on. The honey-comb and the spider's web are, without doubt, wonderful in their structure; but they are in no respect more wonderful than the elaborate structures which the microscope displays to us in every tissue of animals and vegetables; even in the mathematical exactness of form, so much celebrated, they are not superior to the regular hexagons which form the epidermis of many plants, and which we find equally regular in the same tissue of certain reptiles. Now, the former structures are not held to be more wonderful than the latter, because they are fabricated by the instrumentality of muscular fibres; for in that point of view we should marvel more at the latter, which are fabricated by less perfect instruments—vessels and cells. The true cause why the former structures have been regarded with most wonder is, that it has been supposed that the action of the muscles which form them must be voluntary—a supposition which implies necessarily the existence of a directing mind. Now, the physiology of the present day gives no countenance to such a supposition. It shows us, on the contrary, innumerable muscular acts in all animals, with which volition has no more to do than with digestion or nutrition. Such acts may originate in external impulses which excite the nervous system, and the acts follow immediately, as if from a physical necessity. They may originate also, as in the case before us, in internal impulses, derived from the organic condition of the tissues of the body, and the changes they are continually undergoing. The two series of structures which we have brought into comparison are therefore to be regarded as the products of the same organizative or plastic force; which, acting in one way, employs vessels and cells for its instruments, and produces, within the body, the innumerable structures of which animals and vegetables are made up; and, acting in another way, employs for

its instruments muscular fibres under the direction of the nervous system, and produces, without the body, structures which bear the same impress of regularity and beauty as those within it, and co-operate with them to the same ends—the preservation of the individual and the species. Corals and other polypidoms may be considered as standing in the very same relation to the swarms of zoophytes which people them, in which the honey-comb does to a swarm of bees. Both are structures external to the bodies of the animals which produce them, and both are the products of the same organizative power; the only difference being, that in the one case this formative power employs its ordinary instruments—cells, and possibly vessels—while in the other it employs the more unwonted apparatus of muscular fibres.

I have more recently had an opportunity of examining several animals killed by the Ferret. I found that instead of there being only one wound, there are always several, as might, indeed, have been inferred from the mechanism of the jaws, and their being armed with four tusks. The wounds are so minute as to be imperceptible externally, unless one of the tusks has pierced the jugular or some other superficial vein, so as to stain the surrounding skin with blood; but as this, although generally, does not always happen, there may be no external mark visible. But, on dissecting off the skin, the wounds become at once apparent in the cellular and muscular substance beneath. The injury done to the upper part of the spine is therefore more extensive than I had at first supposed. It is also less uniform in its seat; as I more than once found that the tusk had pierced the cranium, and gone deep into the back part of the brain. The mode of attack is also very various, according to the relative strength of the combatants; but the struggle is always brief; and the Ferret never remains after it to suck the blood.

From these observations, confirmed as they were in all essential respects by many others made under the eye of an intelligent friend, I was disposed to conclude that the vulgar belief of the Ferret destroying its victims by blood-sucking was erroneous; and that it had most probably arisen from the appearance of the dead animals, which exhibit commonly no mark of injury but a small wound, surrounded by a bloody patch on the neck. Now, the very same appearance would be produced by a leech fastening on the neck: and hence most probably it was inferred that the leech and the Ferret practised the same mode of attack. This opinion has, however, received the sanction of the highest authorities in natural history. Buffon says*, “The Ferret is naturally the mortal enemy of the rabbit. On presenting a rabbit,

* *Histoire Naturelle*, vol. vii. p. 211.

even dead, to a young Ferret that has never seen one before, it throws itself upon the body and bites it with fury ; and, if the rabbit be alive, the Ferret takes it by the neck or by the nose, and sucks its blood." In the '*Dictionnaire des Sciences Naturelles*'*, Ferrets are described as being of a most sanguinary nature : " It is even more the blood than the flesh which they seek for their nourishment." MM. Geoffroi St. Hilaire and Fred. Cuvier, the authors of the splendid work '*Histoire Naturelle des Mammifères*,' repeat the same opinion :—" The Ferret, in attacking a rabbit, seizes it by a part of the head, masters it, and sucks its blood, and, as soon as satisfied, falls asleep."

As the above quotations refer chiefly to the rabbit, and as it was possible the Ferret might not practise the same mode of attack upon that animal as upon the rat, I resolved to put the matter to the test of experiment. My first trial was made with a full-grown male rabbit, and a Ferret nine months old, which had never seen a rabbit before. The Ferret immediately commenced the attack, but it was always repulsed, and ultimately obliged to retire altogether, the rabbit adopting a very remarkable mode of defence ; for whenever the Ferret came near, he sprung right upwards, and came down with the whole force of his hind legs upon the head of his assailant. I now sent off the rabbit, to be tried with the old Ferret which had killed the two rats, as mentioned above. The distance was too great to admit of my being present ; but I received a full report of what passed from the friend already mentioned, whose zeal in natural science led him to take an interest in the experiment. The rabbit pursued the same tactics in defending himself as before ; and so long as he had free space for his evolutions he came off victorious, as the Ferret could never get an opportunity of laying hold of him. They were therefore put together into a box. There the Ferret soon succeeded in seizing the rabbit across the root of the nose, shaking him, as a dog does, from time to time, and never letting go the hold till the rabbit ceased to live. Instead, however, of despatching him in the course of a few seconds, there was a full half-hour from the commencement till the end of the struggle. It was agreed by all present, that while the Ferret held on by means of her teeth, she sucked the blood flowing from the wound. The dead rabbit being sent to me for examination, I found the vessels as full of blood as usual ; the brain had not been injured ; the bones of the nose and orbit had been pierced ; but the main injury done had been to the eyes, which were completely disorganized and full of blood.

It thus appeared that the idea of the Ferret sucking blood was

* Article Martes, division Putois.

not without some practical foundation. I was, however, at the same time convinced that the observations from which it had been inferred that the animal always causes death by the abstraction of blood, must have been very superficially made. I have been assured by persons well-versed in such matters, that even the rabbit is frequently destroyed by a wound in the neck; and I recollect well, when a schoolboy, of having had a young rabbit destroyed by a weasel, and of the astonishment I felt at seeing upon it, when dead, no mark of injury of any kind, but the mysterious bloody patch and small wound on the side of the neck, described above. The truth seems to be, that whenever the Ferret attacks an animal which it is capable of mastering by main force, it despatches him, not by blood-sucking, but by the most speedy and merciful of all modes of inflicting death—piercing the upper part of the spinal marrow; but that when it is opposed to animals of large size and strength superior to its own, it alters its mode of warfare, seizing them where opportunity offers, and clinging to them till they expire from loss of blood, pain, and exhaustion of strength.

XLI.III.—*Additions to the Fauna of Ireland, including a few species unrecorded in that of Britain;—with the description of an apparently new Glossiphonia.* By WILLIAM THOMPSON, Pres. Nat. Hist. and Philos. Society of Belfast.

[Continued from p. 315*.]

MOLLUSCA.

Nassa varicosa, Turt. (sp.). *Tritonia varicosa*, Turt. Zool. Jour. vol. ii. p. 365. pl. 13. fig. 7.

A dead specimen was dredged (depth twelve to fifteen fathoms) off the south entrance to Bantry Bay in May 1846 by Mr. MacAndrew.

Pleurotoma teres, Forb. Ann. Nat. Hist. vol. xiv. p. 412. pl. 2. fig. 3.

One dead specimen was dredged from about fourteen fathoms in Birterbuy Bay, county of Galway, in the summer of 1845 by Mr. Barlee. This gentleman—when accompanied by Mr. Jeffreys—obtained in the same bay very fine specimens of the rare *Pleurotoma Boothii*, Smith (sp.)—*Fusus Boothii*, Wern. Mem. vol. viii. p. 98. pl. 1. f. 1.

* As the marks of doubt placed *after* Bonaparte's Sandpiper and the Sword-fish, in the first part of this communication (p. 311, 314) might convey the erroneous impression that there is uncertainty respecting the species, it seems to me desirable to state, that there is no doubt on that subject. Those marks should rather have been placed *before* the name as expressive of uncertainty about the admission of the species into the Irish Fauna.

Pleurotoma striolatum, Scacchi, Philippi, Enum. Moll. Siciliæ, vol. ii. p. 168. pl. 26. fig. 7.

A single recent, but dead specimen taken with *Nassa varicosa*, as above. At the late Meeting of the British Association, this was noticed as the first instance of the species having been obtained in the British seas; but Mr. Alder has since informed me that he procured it in Torbay, Devonshire, in the summer of 1845.

Pleurotoma brachystomum, Philippi, *ibid.* vol. ii. p. 169. t. 26. fig. 10.

This species was found in Bantry Bay in the summer of 1844 and 1845 by Mr. Barlee, who has this season procured it on the west coast of Scotland. It was dredged at Zetland by Mr. MacAndrew and Professor E. Forbes, in 1845.

Pleurotoma lævigatum, Philippi, *ibid.* vol. i. p. 199; vol. ii. p. 169. t. 11. fig. 17.

Mr. Alder writes to me as follows in Oct. 1846:—"I have two specimens of what I take to be *Pleur. lævigatum*, Phil., from Dr. Farran, who got them in Connemara. This shell I have had undetermined in my cabinet for some time, as Mr. Clark gave me worn specimens several years ago, but there was a doubt at that time whether it was not a variety of *P. nebula*. It appears to be constant in its characters, and a good species." This is the first notice of its occurrence in the British seas.

Ovula patula, Penn. (sp.).

A shell of this species, found some years ago on the sandy beach of Magilligan, county of Londonderry, by Mrs. R. A. Hyndman of Dublin, is in the cabinet of Mr. Hyndman at Belfast.

Natica Montagui, Forb. Malac. Monensis, p. 32.

Three or four specimens were obtained from a depth of forty-five fathoms off Cape Clear by Mr. MacAndrew;—who remarks: "I have besides met with it only on the west coast of Scotland and at Zetland; it is there a common shell in from twelve to fifteen and up to fifty fathoms, on a rather hard bottom." A living *N. Montagui* was dredged in Belfast Bay at the same time with the following species.

Emarginula crassa, Sowerby, Forbes, Ann. Nat. Hist. vol. xiv. p. 410. pl. 11. fig. 1.

A few specimens taken at the Kish Bank in 1845 by fishermen, were found in their boats on their return thence to the Dublin coast by Mr. Doran, jun. (collector of objects of natural history), of whom they were purchased by Mr. Hyndman. This gentleman and Mr. Edm. Getty, when dredging at the entrance of Belfast Bay on the 3rd Oct. 1846, obtained from a depth of twenty fathoms five dead shells of this species. These were from 9 to 14 lines in length; the specimen of this latter size was 10 lines in breadth and 8 in height. A few living and dead specimens of *Emarg. fissura* were dredged with the *E. crassa* on this occasion.

*Pecten fuci**, Gmelin. *P. Landsburgii*, Forbes, Wern. Mem. vol. viii.

Procured on rocky ground, east of Cape Clear (forty to forty-five fathoms), by Mr. MacAndrew, who remarks, that "it is a common, though rather deep-water species. I have obtained it at Scilly, Isle of Man, Mull of Galloway, Glenluce Bay, Clyde and Hebrides—generally adheres to stones; only at Oban have I found it attached to the *Fucus*."

Pecten similis, Laskey, Wern. Mem. vol. i. p. 337. pl. 8. fig. 8.

Numerous valves were dredged from forty-five fathoms off Cape Clear by Mr. MacAndrew, who finds it "an abundant deep-water species from Scilly to Zetland." This species was noted at the suggestion of Professor Edw. Forbes as probably synonymous with *P. lævis*, in my Report on the Invertebrata of Ireland.

Arca raridentata, Searles Wood in Charlesworth's Mag. Nat. Hist. vol. iv. p. 232. pl. 16. fig. 4.

A living specimen, and a valve of this *Arca*, were obtained with the last species. It is a *crag* shell. Mr. MacAndrew procured it alive for the first time off the island of Skye in the summer of 1845.

Neera cuspidata, Olivi (sp.).

An imperfect specimen was taken with the preceding two species.

Lucina lactea, Poli (sp.), Lam.

Procured off the south-west coast by Mr. MacAndrew—off Baltimore Harbour, thirty fathoms; and from twelve to fifteen fathoms in Bantry Bay.

Tellina balaustina, Linn.

Two valves of this species, as determined by Mr. G. B. Sowerby, were dredged on the occasion already alluded to in Birterbuy Bay by Mr. Barlee. It has not before been noticed as inhabiting any of the coasts of the British Islands.

Montacuta oblonga, Turt. Brit. Biv. p. 61. pl. 11. figs. 11, 12.

Taken in fine sand from thirty fathoms between Baltimore Harbour and Cape Clear by Mr. MacAndrew, who adds, "frequent in company with fine live specimens of *Eulima subulata*."

Botrylloides albicans, Edwards, Ascid. Compos. p. 88. pl. 6. fig. 2.

July 16, 1846.—I found this species attached to the under side of a stone in a pool between tide-marks at Springvale, county of Down. It was likewise attached to *Fuci* (*F. vesiculosus*, &c.) growing in the rock-pools, and was in much smaller masses than the following species; generally but one system of individuals existed in each mass.

* Since the above note was sent to press, I have learned from Mr. Barlee that he obtained this species in Birterbuy Bay (co. Galway) in the summer of 1845.

On the small branches of *Fuci* to which it was attached, there was not room for more; nor was there indeed on the broadest portion of the main stem, whence the leading branches of the plant issued:—the latter is its favourite position. The specimens agreed in all respects with the description and figures in Edwards's work.

Botrylloides rotifera, Edw. Asc. Comp. p. 85. pl. 6. fig. 1?

was attached to the under side of the same stone with the last, and covered several square inches of its surface. I mark it with doubt on account merely of some little difference in colour. The "consistance gélatineuse" was rather hyaline than "jaunâtre;" the individual forms were more of a uniform red than in Edwards's figure, and were each as brightly coloured as in *B. rubrum*, Edw., and of the hue that it is represented to be. The individuals being arranged in a scattered manner, and not thrown into masses as in *B. rubrum*, was a striking character.

There is no record of these two species of *Botrylloides* having been procured on any other part of the coast of the British Islands.

CIRRHIPEDA.

Adna anglica, Leach.

Three dead specimens were obtained on fragments of *Caryophyllia* from rocky ground east of Cape Clear—forty to fifty fathoms, by Mr. MacAndrew.

NOTE.

Balanus punctatus, Mont.,

to the exclusion of every other species or form, profusely covers over the stones and rocks between and above tide-marks, on various parts of the coast of Down, as I have also observed it to do on the Dublin coast.

* CRUSTACEA.

Lynceus lamellatus, Müll. *Eurycercus lamellatus*, Baird.

Taken in Lough Neagh at the beginning of August by Mr. A. H. Haliday and W. T.

Cypris reptans, Baird?

Taken with last; together with a species of *Daphnia*, believed by Dr. Baird to be undescribed: the *Lynceus* and *Cypris* were named by this gentleman; the specimen of the latter being in a bad state was marked with a note of doubt.

* *Scorpionidea*.

Obisium maritimum, Leach, Zool. Misc. vol. iii. p. 52.

A very few individuals were taken in fissures of marine rocks at Bangor, (Downshire,) in July 1840, by Mr. Hyndnan and myself; one specimen was obtained by us under a stone between tide-marks at Gull Island, Strangford Lough, in June 1846. I compared the Irish specimens with Leach's in the British Museum. The west of England is the only habitat assigned to the species in the 'Zoological Miscellany.'

NOTES.

Portunus holsatus, Fabr., Bell, British Crustacea, part 3. p. 109 (1844).

Professor Bell remarks at p. 111 of the excellent work just referred to, in reference to this species :—"In Ireland, according to Mr. W. Thompson's statement, it has occurred repeatedly ; but as it appears to me that faded specimens of *P. marmoreus* might be easily mistaken for this species, it is always desirable that they should be compared with those well-distinguished specimens which exist in the British Museum." If the figures in any work will suffice, so as not to render necessary an examination of actual specimens, that work is in my opinion Leach's 'Malacostraca Podophthalmata Britanniae.' Several years ago I compared a number of the figures in it with the specimens in the British Museum from which they were drawn by Sowerby, and found them to be represented with such extraordinary accuracy, that I considered a reference to the work itself all-sufficient from that time forward.

The suggestion of my friend Professor Bell commands my entire acquiescence as a general rule, but the comparison was in the present case unnecessary, as the *Portuni* in question from the several localities which I named, were, as stated by me, the *P. lividus* of Leach's work (*P. holsatus*, Fabr.) as contradistinguished from his *P. marmoreus*. Of this fact, I had the pleasure of affording Prof. Bell ocular demonstration on my next visit to London after the publication of the preceding extract. But whether or not these *Portuni* are really distinct species—judging from series of specimens obtained by the author of the 'History of British Crustacea' since the publication of part 3—is for him, and not for me to state. It may be added, that colour alone, unaccompanied by structural differences, was never in the case of any species regarded by me of the least specific value.

Pagurus Cuanensis, Thomp., Bell, Brit. Crust. part 4. p. 178.

June 22, 1846.—A specimen of this *Pagurus* was dredged in Strangford Lough—in fifteen to twenty fathoms water—by Mr. Hyndman and myself. It was alive and inhabiting a *Trochus magus*. A conspicuous character was presented in its beautifully ringed antennæ. These were of a bright red hue alternating with pure white or yellowish horn-colour, the rings of each colour very unequal in extent. The portion of the body exposed to view when this *Pagurus* is *in situ*, is prettily mottled over with reddish brown and white.

ANNELIDA.

Nemertes melanocephala, Johnst. Mag. Zool. and Bot. vol. i. p. 535. pl. 17. fig. 5.

Under stones resting on a rich oozy sand between tide-marks at Gull Island, Strangford Lough, two of this species were obtained in June last by Mr. Hyndman and myself. Both were of a pale yellow colour ; the one half an inch, the other an inch in length : they agreed in every respect with the description and figures cited.

Borlasia octoculata, Johnst. id. p. 537. pl. 18. fig. 2.

A few specimens agreeing in size and all the characters with the description and figures were obtained with the last.

Borlasia purpurea, Johnst. id. p. 537. pl. 18. fig. 3.

This species, differing little from the last in any external character but that of colour, was procured at the same time, but was much more numerous. Several specimens of this and the other species of the same family here noticed were kept alive for three weeks in a phial of sea-water, and thus afforded ample opportunity for observation. The water was not changed during that period, but the length of time that they would have lived under such circumstances was not ascertained, in consequence of my leaving home. The individuals of this species were about 3 inches in length and perfectly agreed with the description and figures: some had only six, and others eight eyes as stated by Dr. Johnston.

Borlasia olivacea, Johnst. id. p. 536. pl. 18. fig. 1.

A worm agreeing in all characters of form and colour with this—having four eyes, and marked with red over the site of the heart; characters specially named as they are apparently not constant—was procured between tide-marks in July 1846 at Bangor, Downshire, by Mr. Hyndman and myself. A specimen agreeing with this, except in having eight eyes, was taken with the species noticed as obtained at Strangford Lough in June, but, judging from zoological characters only, I could not think that it was distinct from *B. purpurea*.

Planaria lactea, Müll. Zool. Dan. vol. iii. p. 47. pl. 109. figs. 1, 2 ?

This species is marked with doubt from the circumstance of its differing in the following characters from *P. lactea*. The chief central vessel represented in the figure as of about equal breadth throughout, expands in this into an ovate form about the centre of the body—and the ramifications from it, represented as purple in *P. lactea*, are in this of a rich fawn-colour. My specimens are 9 lines in length, when the breadth is 2 lines; eyes pyriform, generally two in number, placed as in *P. lactea* (a specimen had two at one side, and one eye at the other); colour milk-white, but the main vessel and its ramifications, spreading throughout all the body except the mere margin, imparts a handsome delicate fawn-colour to the animal. All of the many specimens taken were of the same colour; the size already noted marks them as considerably larger than Müller's. When in motion they were generally more elongate (of about equal breadth throughout) than *P. lactea* is represented to be, but occasionally appeared of the same form as the figure in the 'Zoologia Danica.'

During an excursion round the shores of Lough Neagh at the beginning of August 1846, when I was accompanied by Mr. A. H. Haliday, this species was found to be very common, attached to stones at the margin of the lake, and to subaquatic plants. It was grega-

rious, several individuals being generally adherent to the under side of a stone a few inches in diameter.

Planaria nigra, Müller, Z. D. vol. iii. p. 48. pl. 109. figs. 3, 4.

This species was found abundantly in the same localities, and under similar circumstances with the last. With the unimportant exception of being more of a brown colour and of rather less size, they perfectly agreed with the figure in the 'Zoologia Danica,' and also with the description, so far as given. They were when fully extended 3 lines in length; under a high magnifying power a row of black dots appeared closely disposed round the margin of the anterior part of the body. Sir John G. Dalyell figures similar dots in his *P. nigra* ("Observations on Planariæ," fig. 5), but in my specimens there are three for one represented in it—in the description however they are mentioned as numerous.

August 22, 1846.—Three *Planariæ* agreeing with Sir J. G. Dalyell's *P. nigra*, and brought from the pond in the Zoological Garden, Phoenix Park, Dublin, with *Hydra*, &c. in May last, are now living before me. These differ from the *P. nigra* of the 'Zool. Dan.' in being of a jet-black, of a much softer consistence, more shapeless, and being able to diminish themselves to a much less size.

When at rest they sometimes appear as a round black spot, not more than half the size of the other when contracted to the utmost, though when stretched out they reach its full dimensions:—they are much more protean in the forms they assume. The softness alluded to is well shown in Dalyell's figure 15—the L. Neagh specimens are always of a firm consistence. When changing the water on these *Planariæ*, the individuals (I shall not call them distinct species) from each locality exhibited a marked difference, though all appeared in equally good health, the latter always retaining their hold against the sides of the phial, while the others, though the liquid was poured out in the gentlest manner, became detached. Specimens which I have obtained on subaquatic plants in ditches at the outskirts of Belfast were similar to those from Lough Neagh.

Planaria torva, Müll. Z. D. vol. iii. p. 48. pl. 109. figs. 5, 6.

Several individuals just as described and figured in the work referred to were obtained under stones at Church Island, Lough Beg (adjoining L. Neagh), on the occasion alluded to under *P. lactea*. Templeton notices "*P. fusca*, Pallas," as Irish (Mag. Nat. Hist. vol. ix. p. 239) without giving any particulars respecting it. This species and *P. torva* are said by Duges to be identical (Lamarck, 2nd edit. vol. iii. p. 607).

Nepheleis octoculata, Moquin-Tandon, Monog. Hirud. p. 302. pl. 3. figs. 1–11. 2nd edit.

Four individuals of this species found among subaquatic plants at Lough Neagh on the occasion already alluded to were brought home for examination. They were not more than half the size of those figured by M.-Tandon, nor of so dark a hue generally—anteriorly

they were somewhat hyaline. They each possessed eight eyes, which changed their places like objects in a kaleidoscope; their usual position was, the four anterior in a straight line across the body, and so they always appeared when the anterior portion of the body was pressed against the phial in the act of progression: the hinder pairs of eyes generally appeared as here represented, or across the body, but occasionally displayed themselves in the opposite direction thus, and the anterior eyes were then seen as figured, the head of the creature at the same time having quite a truncated aspect. Of several species of "*Hirudinées*" brought from L. Neagh and kept alive for a few weeks*, this was the only one that had the power of swimming; it was extremely active, and wriggled about through the water like an *Ammocetes*—it was truly "as merry as a grig."



August 20, 1846.—Among the *Hydræ*, &c. alluded to under *Planaria nigra* as brought from the Phoenix Park, Dublin, was an individual of this species:—the water from which it was taken for examination today had been kept unchanged for three months in a large glass globe.

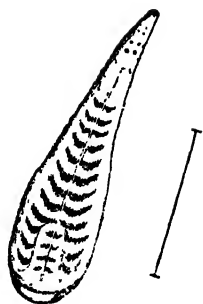
Glossiphonia Eachana, Thompson.

Specific Character.—"Body oval; anterior portion not dilated into a distinctly-formed head; back smooth;" margin slightly crenulate; eyes eight; stomachal lobes eight, subpinnate; prevailing hue hyaline.

The size commonly extends to 9 lines. The eight eyes are disposed in four pairs, each pair on the same segment of the body, the two hinder pairs the larger; eight pair stomachal lobes anterior to great stomachal pouches, subpinnate—as much so as represented in *G. marginata*, Moq.-Tandon, pl. 14. f. 14. 2nd edit.—the two anterior pair are small, and when empty but little apparent; from each side of the stomachal lobes emanate four subpinnate branches which appear in a continuous row with the stomachal lobes anterior to the pouches on each side. It may be remarked that the spur-like form of the stomachal pouches (see pl. 13. fig. 6 c & d, Moquin, 2nd edit.) was not always clearly defined, in which state their four branches appeared as if issuing directly from the main trunk like the anterior eight pair of lobes. This difference will be understood by a reference to Moquin-Tandon's figure 4. of plate 13 (2nd edit.) representing the ordinary appearance, and his fig. 3. pl. 4 (1st edit.) the latter. Four pair of cæca. *Colour*—back viewed with a very high magnifying power exhibited about four distinct rows of white spots, with a few smaller spots irregularly interspersed; but the general aspect was of a glassy transparency of a very pale red tinge, imparted to it by extremely minute dots of red disposed over the body and disc. This glassy transparency rendered the vessels of the di-

* In addition to those named in this communication as previously unrecorded, there were *Glossiphonia sexoculata*, *G. bioculata* and *G. tessellata*.

gestive system, which were of a fine dark red colour, very conspicuous; and, owing to the jagged outline of the series of lateral lobes, &c. the creature was so extremely beautiful, that it might be compared to an arborescent agate. It is well-entitled to the epithet *vermiculus splendidissimus* applied by Müller to the very nearly allied *Gloss. heteroclitu**. To that species, it indeed, judging from the description, bears a strong resemblance—but belongs to a different division of the genus:—to that defined as having more than six stomachal lobes, which are more or less pinnate, and termed “*Lobina*” by Moquin-Tandon (p. 369. 2nd edit.). This is the genus *Hæmocharis* of Filippi (not of Savigny): the species here described may be termed *Hæm. Eachana* by those who consider the characters of generic value.



Pontobdella levis, Blainville, Moquin-Tandon, Monog. Hirud. p. 290. 2nd edit.

A *Pontobdella* in my collection agrees with this species in all the detailed characters assigned to it in the work referred to, in which the description is taken from Blainville's in the 'Dict. Sci. Nat.' t. 47. 1827, p. 243. The species differs from *P. muricata* and *P. verrucata*, as its name denotes, in being smooth; which it is all over the surface. Where the specimen described by Blainville was procured was not known; but it is stated to have been sent to him by M. Paretto of Genoa. Mine, which may be noted as 4 inches in length, was obtained alive in April 1838, either at Portpatrick or Donaghadee by Capt. Fayer, R.N., who commanded the mail steam-packets between these ports. This gentleman remarked at that period, when sending me the specimen, that he found it in the bottom of a fisherman's boat, into which it must have been brought with sea-weed, then being gathered for manure at low-water. This *Pontobdella* gave out to the spirits in which it was put for preservation a beautiful scarlet colour. A specimen of *P. muricata* which I lately (Oct. 1846) received imparted a beautiful and intense green colour to the spirits in which it was placed.

NOTES.

Ditrupea subulata, Berkeley.

The only part of the coast on which this interesting species has hitherto been noticed being the north-west (Zool. Jour. vol. v. p. 424), it may here be mentioned that specimens dredged by Mr. MacAndrew from forty fathoms, and still deeper water off the Old Head of Kinsale and Cape Clear, have been kindly given to me by that gentleman, as have others by Mr. Stutchbury (the able Curator of the

* Müller, 'Helminthica,' p. 50, where a very full description is given of the species.

Bristol Institution) dredged from ninety-three fathoms, at a distance of ninety miles (English) due south of the last-named locality. Mr. MacAndrew considers this "an abundant deep-water species," and has "obtained it off Scilly in forty-five fathoms; in the middle of St. George's Channel from sixty fathoms; and westward of Zetland from eighty fathoms."

Planaria cornuta, Müll., and *P. vittata*, Mont.

In the month of May 1845 I made a communication to this Journal (vol. xv. p. 320) on the subject of the *P. cornuta*, Müll., in which it was remarked, that the individuals described were more round in outline than Dr. Johnston's specimens, as represented in the 'Magazine of Natural History,' and still more so than those of the 'Zoologia Danica,' but that I was unwilling to consider them as specifically different.

In the following month of September, M. Quatrefages published in the 'Annales des Sciences Naturelles,' an elaborate and splendidly illustrated memoir on *Planariæ* discovered by him on the coasts of France, Italy and Sicily, and gave new names to the species. One of these, found at St. Malo, is the same as that obtained in Belfast Bay, and is called *Proceros sanguinolentus*. No reference is made by the author to the *P. cornuta* described and figured by Müller in the 'Zoologia Danica,' and by Johnston in Loudon's 'Magazine of Nat. Hist.' for 1832, either with respect to his species being the same, or nearly allied to them. Having myself looked critically to the subject, I can state with certainty that the species procured in Belfast Bay is identical with that of Quatrefages, and have indeed no doubt that Dr. Johnston's is also. Müller's I am now rather disposed to regard as different, in which case the name of *Proceros sanguinolentus*, Quat., or *Planaria sanguinolenta*, Quat., may be adopted for the British species.

In the same memoir, this author described and figured what is called a new species under the name of "*Proceros ? cristatus*." This is the *Planaria vittata*, of which a description and figure were given by Montagu in a paper read to the Linnean Society in 1807, and published in the 11th volume of the 'Transactions.' This author knew the species only from two individuals taken at the same time at Kingsbridge, Devonshire. The next notice of it known to me is in a communication made by myself to the 5th volume of the 'Annals' (p. 247), in which an individual was recorded as dredged in Strangford Lough in October 1839. In the month of July of the following year we took a second specimen (between tide-marks in this instance) at Roundstone, on the western coast of Ireland.

It is to be regretted, for the sake of science, that M. Quatrefages, who is bestowing such unwearied attention on the more obscure portions of the marine *Invertebrata*, and illustrating his subjects in such a splendid manner, should not have been aware of the investigations of those who have preceded him, and above all of the writings of Montagu, whose researches were chiefly made on the opposite side of the same channel as his own. This species is an in-

stance in point, having been found by M. Quatrefages at St. Vast-la-Hogue in Normandy, and Montagu's, as already stated, in Devonshire.

ECHINODERMATA.

Brissus lyrifer, Forbes, Brit. Echin. p. 187.

Of this species—discovered by Professor E. Forbes in the Clyde in 1840—a few individuals were obtained off the south-west coast of Ireland by Mr. MacAndrew. To use this gentleman's words, "One or two specimens were brought up from a depth of forty fathoms off Cork, and off Cape Clear, and from thirty fathoms in Bantry Bay, near Great Bear Island. I have found it a frequent inhabitant of muddy bottoms in from 12 to 100 fathoms."

Holothuria.

Since the publication of Forbes's 'History of British Echinodermata,' a species of this genus as now limited (with normally twenty tentacula) was noticed by Mr. Couch in the 'Cornish Fauna' (part 2. p. 73); and another, believed by Mr. Peach to be distinct, has been described and figured in the 'Annals,' vol. xv. p. 171. pl. 14. At Tory Island, off the north-west coast of Donegal, Mr. Hyndman procured a specimen of this genus in a rock-pool between tide-marks in August 1845. I abstain from naming the species even with doubt in the present state of our knowledge of the *Holothuriæ*.

Syrinx Harveii, Forbes, Brit. Echin. p. 249.

Two specimens of a *Syrinx* were dredged in Strangford Lough from a depth of fifteen to twenty fathoms on an oozy bottom in June last by Mr. Hyndman and myself. They agree with the *S. Harveii*, and at the same time with the *S. granulosus*, M'Coy (Annals, vol. xv. p. 272. pl. 16. fig. 2), accordingly as they are viewed by the unassisted eye or by magnifying power. The body of the former is described as being "quite smooth," of the latter "nearly smooth, very minutely and uniformly granulated;" a difference which we might expect to find between examples of $2\frac{1}{2}$ and 7 inches in length; these being the respective dimensions of those described by Professor Forbes and Mr. M'Coy. The body of my specimens—the larger of which is under 2 inches in length—appears to the unassisted eye not only quite smooth, but shining, though in a subdued tone; yet, when magnified, extremely minute papillæ are seen over its surface. I therefore regard *S. granulosus* as not distinct from *S. Harveii*. The figure of *S. granulosus* represents my specimens very well: they are of a very pale grayish brown colour.

NOTES.

Cucumaria fusiformis, Forbes and Goodsir, Brit. Echin. p. 219.

This species has already been enumerated in my Report on the Invertebrata of Ireland, but no particulars respecting it have been published. The specimen there alluded to, was dredged in ten

fathom water, at Donaghadee, by Dr. J. L. Drummond in the summer of 1843.

Cucumaria Hyndmani, Thomp., Forb. Brit. Echin. p. 225.

A specimen of this *Cucumaria*, hitherto known only as Irish, was taken at Saltcoats, Ayrshire, in June 1845, and has been kindly sent to me by the Rev. D. Landsborough.

ZOOPHYTES.

Coryne Listeri, Van Ben. (sp.).

Syncoryna Listeri, Van Ben. (sp.), Johnst. Brit. Zooph. p. 41. pl. 2. 2nd edit.

I obtained this zoophyte in July last attached to stones between tide-marks at Ballyholme, Belfast Bay. Both polype and polypidom agreed in every character of form and colour with the description given in Dr. Johnston's work, but I cannot think this and the *Coryne* (*C. squamata*, Johnst. Brit. Zoop. pl. 2. figs. 2 & 3. 1st edit.) which is commonly found on the *Fuci* (especially *Fucus nodosus*) of our shores, the same species. This latter generally forms masses at the base of the branches and around the stem of the plant named: each individual rises singly from its base, as represented in the figures referred to. The one is a branched, the other a simple species: the polypidom is horny (*Tubularia*-like) in *S. Listeri*; in the other soft and fleshy.

Turbinolia milletiana, Defrance.

This species, only known as fossil until Mr. MacAndrew dredged it alive off the coast of Cornwall in the spring of 1845, was obtained by similar means off the Isles of Arran (Galway Bay) in the summer of that year by Mr. Barlee.

Since this note was taken, the Irish station has been published in the 2nd edit. of Johnston's 'Zoophytes.'

Corynactis Allmani, Thompson.

A species of *Corynactis*, differing considerably from *C. viridis*, Allman (Ann. Nat. Hist. vol. xvii. 417. pl. 11), has been procured by dredging in Belfast Bay and Strangford Lough (fifteen to twenty fathoms). It is somewhat doubtfully on my part given as specifically distinct from *C. viridis*; but Professor Allman, to whom a specimen was submitted in a living state, considers it to be so.

Spec. Char.—*C.* with several regular concentric series of capitate tentacula, those of the third and fourth rows being about equally regular and numerous as those of the two outer rows: those nearer the mouth irregularly disposed.

The colour—red of various shades—is wholly different from that of *C. viridis*, though not included in the diagnostic characters. A full description of the species has been forwarded to Dr. Johnston for the 2nd edition of his 'British Zoophytes.'

Dysidea ? papillosa, Johnst. Brit. Sponges, p. 190. pl. 16. fig. 6.

This species, dredged from a depth of fifteen to twenty fathoms

in Strangford Lough, on the 22nd June last, by Mr. Hyndman and myself, was brought home in a living state, and proved on the expansion of its tentacula to be a Helianthoid Zoophyte. It was then noted as—"Coming very near *Zoanthus*, Cuv. (Règ. Anim. vol. iii. p. 293. edit. 1830), if indeed it should be generically separated from it. The character of 'each individual rising from a common base' does not apply to it, and the generic character must consequently be either altered to suit the species, or this be constituted a new generic form." Other observations made at the same time are now unnecessary (as the sequel will show)—the preceding note is given merely with reference to one on this subject at p. 252, second edition 'British Zoophytes.'

When lately on board Mr. MacAndrew's yacht at Southampton, Professor E. Forbes pointed out to me living specimens of *Zoanthus Couchii* (according to the Cornish Fauna) which had been dredged off the southern coast of England, and these to my surprise proved to be the same species as I had obtained.

All the specimens named "*Z. Couchii*" that I had previously seen, were the very different *Sarcodictyon catenata*, Forbes (Johnst. B. Z. p. 179.* pl. 33. figs. 4-7, 2nd edit.). On referring to Couch's work, I agreed with my friend about the identity of the species, which, being certainly the same as that from Strangford Lough, decided, at least to my mind, the question that *D. ? papillosa* and *Z. Couchii* are not distinct. Dr. Johnston, not having seen the living animal, placed his *D. papillosa* doubtfully among the Sponges. In doing so, he judiciously remarked, that it is "nearly allied to the *Alcyonium ocellatum* of Ellis and Solander, Zoop. p. 180. tab. 1. fig. 6; and it is probable that the two productions are of the same nature, whatever this may be."—Brit. Spong. p. 191.

This species was dredged by us in Strangford Lough in 1835, as noticed in the 'Annals' (vol. v. p. 254). It was, as on the last occasion, found adherent to dead bivalve shells—*Venus aurea*, *V. ovata*, *Corbula striata*. The figure referred to in the 'British Sponges' represents the species from this locality.

AMORPHOZOA (SPONGES).

NOTES.

When dredging in Strangford Lough on the 22nd of June last with Mr. Hyndman, we were singularly fortunate in the number of sponges obtained; there were as many species as all our former dredgings combined produced:—the depth was from fifteen to twenty fathoms, the bottom soft and rather oozy. Among them were two new species, which await Dr. Johnston's description: one of these however, previously taken elsewhere is in that author's possession, though as yet undescribed. Three others of interest, although not additions to the Fauna, may be noticed.

* Dr. Johnston has here (p. 180) correctly brought the Youghal species under this—it is the *Zoanthus Couchii* of my Report.

Tethea lyncurium, Linn. (sp.), Johnst. Brit. Sponges, p. 85. fig. 12 (p. 87).

A few individuals of this species were procured: they were both on dead and on living specimens of *Modiolus vulgaris*, and on dead univalve shells. They were all bright yellowish orange in colour (hence Pallas' name *aurantium*) when recent, but became at once discoloured on being put in spirits. The largest *Tethea* is $1\frac{3}{4}$ inch high by $1\frac{1}{2}$ inch in diameter. The numerous spicula were in some individuals confined to the apices of the tubercles, and in others projected from all parts of them, so as to give to the entire surface of the animal when alive a conspicuously hispid appearance. One or two specimens of what seem to be young *Tetheæ* (half an inch diameter) on the same shell with the old, are quite smooth on the surface.

Halichondria (Tethea) carnosa, Johnst. Brit. Sponges, p. 146. pl. 13. figs. 7, 8.

The only locality for this species given in the work referred to, which was published in 1842, is Roundstone Bay, Connemara. The author omitted noticing the species as from Strangford Lough, where I dredged it in July 1838, and sent it to him with many other sponges, on being informed of his contemplated work upon the subject: in the same year this species was procured in Belfast Bay* by Dr. Drummond. In July 1840 it was dredged by our party at Killybeg Bay, Connemara; two specimens thence in my collection, as well as the first alluded to, are attached to *Turritella terebra*. Several procured in Strangford Lough in June last are attached to *Cytherea ovata*—the largest is $2\frac{1}{2}$ inches in height, and quite pyriform.

Halichondria hispida, Mont. Wern. Mem. vol. ii. p. 86. pl. 5. figs. 1, 2; Johnst. B. S. p. 98.

This species was only I believe known from Montagu's description of specimens obtained in Devonshire until the month of March last, when Dr. Scouler, in a contribution to this Journal, (vol. xvii. p. 176) noticed it as having been dredged from deep water at Roundstone by Mr. McCalla, collector of objects of natural history. A few specimens were taken under the circumstances already mentioned in June last at Strangford Lough: the largest is attached to a valve of *Cytherea ovata*, over which its base spreads, and thence it branches out on either side. Montagu's figure of the species is characteristic, and his description admirable as usual, and so full as to require no addition. *Halichondria mammillaris*, *Dysidea fragilis*, *D. ? papillosa* (as already noticed), *Cliona chelata*, &c. were obtained on the same occasion.

The only Irish station given in Johnston's 'British Sponges' for

* It is noticed in the 'Annals' for March last, p. 177, as lately [1845] found here.

the two following species being Dublin Bay, I shall here copy some notes upon them ;—their forms have been known to me since 1835.

Halichondria incrustans, Esper. (sp.), Johnst. B. S. p. 122. pl. 12. fig. 3. and pl. 13. fig. 5.

Abundant, adherent to rocks between tide-marks on the Down coast. Dr. Johnston calls it an "unattractive species," in which—but it is a matter of mere taste—I cannot agree. Its reddish orange colour on the dark rocks is to my eye most lively and pleasing, and more particularly so, when other sponges are in its immediate proximity. At Ballyholme, Belfast Bay, within the space of a very few square feet, this species may be seen in small orange patches on the rock ; *Hal. panicea* in green masses, and by throwing aside the hanging fronds of *Fucus nodosus* (covered by their parasite *Polysiphonia fastigiata*), *Ptilota plumosa* densely clothing the shaded rock is exposed to view, and on it the *Grantia botryoides* and *G. foliacea* grow plentifully, and the *G. ciliata* is sparingly seen.

Although *H. incrustans* inclines generally to look directly down upon the water, or to grow on the under surface of rocks (see Grant, quoted in Johnst. B. S. p. 124), I find it also attached to their perpendicular sides, and when so, the "fecal orifices" are elevated, but not very much, above the surface.

Grantia coriacea, Mont. (sp.), Johnst. Brit. Sponges, p. 183. pl. 21. fig. 9.

was found on an *Anomia* attached to an oyster dredged at Killough, Downshire, March 1835. W. T.

XLIV.—*The Birds of Calcutta, collected and described by* CARL J. SUNDEVALL*.

[Continued from p. 309.]

44. *Bucco philippensis*, Briss., L., Lath., Temm. in Pl. Col. livr. 88.—*B. indicus*, Lath. (*B. parvus*, Gm., Lath. est junior, auct. Temm. loc. cit., quod nomen potius ut specificum adhibendum ; sed junior mihi ignotus.)

Olivaceo-viridis, subtus flavescens viridi-maculatus ; fronte maculaque pectoris antici coccineis ; gula, macula supra aliaque infra oculos flavissimis. (♂ ♀ adulti, simillimi, Febr. Martii.)

Longit. 6 poll. Ala 83 mill., tarsus 18, cauda 38. Pedes pallide rubri. Orbita nuda, rubra. Iris rubra. Lingua plana, lata, basi ut vulgo sagittata ; margine membranacea, apice obtusa ; leviter lacero-bifida. Remigum 1^a brevissima ; 4^a reliquis longior. (Testiculi in medio Febr. tumidi. Ova tumida et oviductus crassitie intestini, initio Martii.)

This handsome little bird was common around Calcutta, and

* Translated from the 'Physiographiska Sällskapets Tidskrift' by H. E. Strickland, M.A.

was said to lay its eggs the beginning of March, but I did not see the nest. A more voracious glutton can hardly be found; the specimens which I killed had not only the stomach but also the throat filled up to the mouth with berries of the two species of *Ficus* (*F. benjamina* and *indica*), which are common in Bengal. Insects were not found in them. The flight and motions were very heavy and inactive. These birds were only seen solitary; they commonly sit upon a branch, and utter almost incessantly their *ho ! ho !* (or *tjo !*) with a strong shaking of the whole body at every note. This sound is pronounced very short, not strong, but tolerably pure, like a rather low note on the flute (from the lower *G* to the second *E*). The same individual always utters the same note, but two are seldom heard to make it exactly alike. When therefore two or more birds are sitting near each other, a not unpleasant music arises from the alternation of the notes, as it sounds most like the tone of bells. The note being feeble and clear, it appears to come from a distance, though one may be only ten or twelve fells from the bird. The Bengal name of the bird is *Benebo*. This name has been by the older writers incorrectly applied to *Timalia grisea* (*Baniah-bow* of Albin).

45. *Bucco cyanicollis*, Temm. *loc. cit.*—*Capito cyanocollis*, Vieill. *Trogon asiaticus*, Lath. no. 8.

Viridis, non maculatus, facie juguloque cyaneis; capillitio coccineo fascia lata media nigricante; puncto utrinque juguli coccineo. (♂ ♀ adulti, Martio.)

8½ poll. Ala 100–108 millim., tarsus 24, cauda 70. Lingua plana, lanceolata, basi non sagittata! apice leviter fissa, laciniis integerrimis. Iris obscure rubra. Orbita nuda obscure rubra. Rostrum flavescens supra nigricans. Ala parum superat anum, remigibus 1–3 gradatis, 4–6 subæqualibus, reliquis longioribus. Rectrices 10, obtusæ, æquales.

This species also is common near Calcutta, and is called the *borro Benebo* (Great *Benebo*), the former being *tjutto* (or little) *Benebo*. It is heavy and dull like the former, lives solitary in the same manner, and feeds on berries, but seemed to be more temperate, and the berries found in the stomach were always broken asunder. The note may be expressed by *rokuroj ! rokuroj !* The middle syllable is uttered a note higher than the other two. Both males and females cry in the same manner, sitting still with outstretched neck. At intervals they were seen to spring aside, or transversely across the branch, with considerable activity, so that at first sight they resemble a Squirrel. They were seen from February to May.

46. *Cuculus ejulans*, n.—Bhrou Cuckoo, Lath. *Gen. Hist.* iii. p. 265. no. 4 (et forte idem ac plures *Cuculi* ex India, ibi e picturis

descripti. Aff. *C. solitario*, Cuv., Le Vaill. Afr. 205,—et *radiato*, Lath. 22.)

Cinereus, pectore sordide fulvescente, ventre cinereo-fasciato; cauda cinerea fasciis 6 angustis, nigris, postice albido marginatis.

♂ adultus Febr., Martio. Magnitudo, structura et ratio partium ut *Cuculi canori*: rostrum, nares, pedesque omnino illius. Differt rectricibus lateralibus minus abbreviatis, et remige 4^a reliquis longiore (in *canoro* 3^a reliquis longior). Longit. 14 poll. Ala 200 millim., tarsus 20, cauda 180. Plumarum rhachides parte occulta paullo tumida, lanato barbata. Color superne immaculatus, vinaceo-cinereus. Gula pallide cinerea. Pectus et latera corporis vinaceo-testacea, posterius pallidiora, fasciis non crebris, transversis, pallide cinereis. Abdomen et crissum albida. Alæ colore dorsi, pennis fuscioribus, intus fasciis triangularibus, abbreviatis albis. Caudæ fasciæ bis arcuatæ; apex latius niger, late testaceo-marginatus. Iris flava. Pedes saturate flavi*.

This species shows much similarity to our Cuckoo, and the mode of life seems also nearly to correspond. When flying or reposing on a tree, as well as when walking on the ground, it altogether resembled that bird, but the note was quite different; it sounds like *parupiu!* *peripiu!* *piripiu!* The third syllable is long, and every word is pronounced about twice, nearly in this manner:—



It thus mounts the scale of notes at every second cry, three or four times, till the note is as high as the bird can raise it, when it makes a short pause and begins anew. Thus it continues for whole hours, especially in the morning and evening, even after it is quite dark. When one is in a house surrounded by trees, as at Serampore, this nocturnal music becomes wearisome, for it is anything but agreeable; it is in the highest degree harsh, grating and incessant. What especially adds to its unpleasantness is that the bird makes all the intervals alike, without attending to the semitones, which to our ears are essential in music. The specimens obtained (two males) were very fat, with tender skins, as in our Cuckoo. They had eaten a great number of caterpillars, but as these were not hairy ones the stomach was not rendered internally villose, as is the case with *C. canorus*.

* This species was first described under the name of *Cuculus varius* by Vahl near fifty years ago in a paper on the birds of Tranquebar in the 'Skrivter af Naturhistorie-Selskabet,' published at Copenhagen, vol. iv. part 1. p. 61. *C. fugax*, Horsfield, and *C. Lathamii*, Gray, Ill. Ind. Orn. are later synonyms.—H. E. S.

during summer, when such larvæ abound, the hairs from which become attached to the internal skin of the stomach. I learnt nothing as to its mode of breeding. The Bengalese name is *Sikkrie*, which is also applied to *Falco tinnunculus* and *melanopterus*, so that here people often confound the Hawks and Cuckoos. I saw and heard this species from February to May, but procured no female. The bird is tolerably shy like our Cuckoo.

47. *Cuculus orientalis*, L. et auct. (= ♂); Horsf. Jav. L. Tr. xiii. — Coucou à gros bec, *Le Vaill. Afr.* 214. *C. scolopaceus*, L. et auct. (= ♀). *Eudynamis orientalis*, Vig. et Horsf. Nov. Holl. L. Tr. xv. (*C. punctatus*, auct., veris ♂ primo anno.)

Nares oblongæ immarginatæ; tarsi breves, cauda fortius rotundata. — ♂ niger. ♀ fusca, albo varia, fasciis caudæ numerosis irregularibus.

Iris sanguinea. Lingua sub-cartilaginea, mediocris, sensim angustata, apice rotundato, integerrimo, striola superne impresso ut rudimentum fissuræ. Rostrum et pedes robustiores, alæ paullo breviores quam in *Cuculis* genuinis. Cutis firma. Plumæ corporis forma vulgari, nec, ut in *Columbis* et *Cuculis* genuinis, scapo tumido.

♂ *adultus* (Febr., Martio) totus pure niger, virescenti nitens, immaculatus. Rostrum pallidum, basi fuscescens. $14\frac{1}{2}$ poll. Ala 181 mill., cauda 180, tarsus 32, digitus medius 28, cum ungue 38.

♂ *jun.* (d. 1 Maii) niger, minus nitens, subtus remigibusque fuliginosus, opacus; remiges tamen ultimæ primariæ et ultimæ cubitales renovatæ, nigræ, nitidæ. Alarum tectrices inferiores et crissum albo undata. Rostrum pallidum flavescens. ♀ (d. 3 Martii ovo subperfecto in oviductu). Supra fusca, æneo-nitens, crebre albomaculata: maculis capitis subtestaceis, longitudinalibus, una in apice singulæ plumæ; dorsi et tectricum parvis, rotundis, 2–3 cujusque plumæ. Subtus alba fusco varia: gula colloque maculis sub-longitudinalibus, et lateribus plumarum fuscis. Pectus, ad pedes usque, fasciis tenuibus, angulatis. Hypochondria et crissum fasciis sub-regularibus. Remiges fuscae fasciis interruptis fulvo-albidis. Rectrices striis circa 18 oblique transversis et flexuosis, albidis. Long. $14\frac{3}{4}$ poll. Ala 180 millim., tarsus 31; digitus medius 27, cum ungue 37, cauda 180.

This also is a noisy bird which occurs frequently near Calcutta. The males were heard all the time that I remained there, crying almost constantly *torrui! torrui!* and both sexes often uttered a note like that of the Kestrel or Woodpecker, *tjee! tjee! tjee! tjee!* They were not seen to alight on the ground, but remained in bushes or small detached trees, and seemed to enjoy the sunshine. They were not shy like the true Cuckoos. The stomach, which was very thin with a soft muscular coating, was always found full of berries; it was never seen to contain insects (Febr.—Apr.). They lay their eggs in March, for in the above-described female was found one which was nearly full-grown, but without

shell. I could not get to see the nest, but according to Levaillant and Buchanan (in Lath. Gen. Hist.) it is like a crow's nest, in which the bird itself deposits its eggs. This species seems to occur in the whole torrid zone of the old continent, including Ulimaroa. The Bengalese name is *kukuill* or *kokill*, formed from the note like the Latin *Cuculus*. The name *Bought-Sallik*, which the older authors give as Indian, I have not heard.

48. *Cuculus philippensis*?, Vieill.—*C. ægyptius* β , auct. (nec *C. bubutus*, Horsf. Jav.). *Niger alis rufis* (Centropus, Illig.).

Between February and April I several times saw near Calcutta a rather large black bird with red-brown wings, which certainly was one of the so-coloured species of *Cuculida*, with a long claw on the hind-toe as in the larks; but it was so shy and wary that I could not succeed in shooting it. It was considerably larger than the foregoing, but less than the Javan *C. bubutus*. Those which I saw were solitary, or two together, and of the same colour as far as I could distinguish. They remained on the ground unobserved among bushes, and always flew up at my approach, after which they glided among the bushes and trees, especially those which grew thickly, till I could no longer perceive whither they had gone. No sound was heard from them. The flight was somewhat noisy like that of poultry. In the stretching-out of the neck, the motions and attitudes of the body, they had also a remarkable resemblance to the *Gallinaceæ*. This resemblance is still greater in certain African species with yet shorter wings, and a gray spotted plumage, so that there is little except the arrangement of the toes, two forwards and two backwards, which distinguishes them from the gallinaceous birds. This difference also disappears in the African *Musophagida* (c. g. *Schizæris cinerea*, Wagl. = *Phasianus africanus*, Lath.) and the American *Penelopide*, which form important links between the Cuckoos and Pheasants. A remarkable similarity is also seen between the Pigeons and the true Cuckoos, to which *C. canorus* belongs. The mode of flight and of walking on the ground, the colours, the tender skin and the structure of the feathers have a great resemblance. The feathers of the body have in both these genera the hidden portion of their shafts considerably thickened, spongy, and furnished with a branched downy web. In the true Cuckoos too the somewhat slender beak has an erect fleshy margin round the nostrils, which is yet more developed in the Pigeons.

49. *Coracias indica*, L. et auct.—*C. bengalensis*, L., &c. *C. nævia* ♂ adult, Wagler, Syst. (*C. nævia* propria ut junior ejusdem speciei loc. cit. describitur, quod in Iside 1829, p. 737. emendatur.)

Rufescens, capite superne ventraque viridibus; capitis lateribus juguloque albedo striolatis; rectricibus æqualibus, violaceis, medio

late albido-cyaneis. Alæ cæruleæ et violaceæ. ♂ (d. 19 Martii) ut descriptio Wagleri citata. Long. $12\frac{1}{2}$ poll. Ala 172 millim., tarsus, 25, cauda 120. Iris obscure rufescens.—♀ vix differt. Junior = Cor. nævia ♀ Wagleri.

The Indian Roller is yet more splendid than ours, which it otherwise much resembles; it has also the same rough ugly voice, but the flight seemed to be less quick, somewhat tortuous, and sometimes almost tumbling. The food consists chiefly of grasshoppers, at least I found nothing else in its stomach. It is common in Bengal (Feb.—May), and is there called *Nilkhont*.

50. *Merops viridis*, L. et auct., et ejusd. var. β , δ et ϵ , Lath. (Var. γ = *M. ægyptius*, Forsk., *Licht.*: gula flava). Viridis, macula oblonga per oculos striaque transversa juguli nigris; gula cærulescente; remigibus pogonio interiori fulvis, apice nigris. Rectricibus 2 mediis apice longissimo, tenui (adultis).

♂ Febr. Color olivaceo-viridis; capite supra, præsertim posterius cum nucha fulvescente. Iris coccinea. Longit. (præter rectrices 2 medias) $7\frac{1}{2}$ poll. Ala 100 millim. Pes e talo ad apicem unguis 26. Rostrum 26. Rectrices 70 = apices 2 elongati 70. Remiges 1^a spuria; 2 et 3 subæquales, integræ; reliquæ apice cordato-incisæ. Lingua longa, tenuis, integerrima, acuta. Cutis maxime firma (vel duriuscula). Musculi occipitis tenues, fere spatii perviis distincti. Ventriculus fortius musculosus.

♀ Similis mari, vix minus nitide colorata.

This handsome bird was seen commonly in trees near Calcutta, but I am uncertain whether they occur later than the middle of March. It does not live in flocks, but several are generally seen near together, and I killed two males at the first shot (Feb. 9). In their stomachs they had insects of all orders, and they were continually seen flying out from the trees to catch these, returning back again almost like a *Muscicapa*. The flight was gliding, with the wings motionless and held straight out, forming an isosceles triangle. I never saw this species wheel round in large circles like Swallows, as the European Bee-eater is said to do. No other sound was heard from them but a soft hissing *rrrrr* ---! which was commonly when they flew. The Bengalese name was said to be *Bashbatta*; but through a mistake of their colours they are also named *Benebo*, which name belongs to *Bucco*, and *Massrenga* which belongs to *Alcedo*. In Latham's 'Gen. Hist.' six other names are given for them.

51. *Alcedo ispida*, L. = *A. bengalensis*, Gm., Lath. (ex Edw. tab. 11. fig. inf.)*.

* *Alcedo bengalensis*, var. β . Lath. = Edw. xi. fig. sup., est distincta species. Simillima, vix minor, capitis lateribus cæruleis; = *A. meninting*, Horsf. Jav. L. Tr. xiii. Temm. Pl. Col. 239. 2. Forte = *A. ispida*, Rafin. Sumatra, L. Tr. xiii. ? An etiam Bengalæ incola?

Var. dorso cyaneo, minus virescente tincto quam in individuīs europæis.—♂ *Adultus* (Calcutta Martio). Longit. 6 poll. Ala 69 millim.; pes e talo ad apicem unguis 25; rostrum e fronte 38; altit. 7; cauda 35. Rostrum totum nigrum, et pedes tenuiores quam in individuīs Europæis collatis. Colores puriores, sed pictura perfecte eadem. Iris obscure fusca. Remigum prima paullo brevior quam 4^a. Alius ♂ (Calcutta Febr.) simillimus sed rostrum basi subtus pallidum. Aliud individuum (Mus. Lund. e Calcutta) simillimum, etiam mensuris et tenuitate pedum; differt rostri altitudine 8 millim. et maxilla inferiore tota pallida.

As long as I remained in Bengal kingfishers occurred there frequently. Near such water-tanks as were surrounded with small trees or bushes, one or two of these handsome birds were always seen sitting, ready to pounce on small fish, their only food. The Bengalese name is *Massrenga* or *Matjrunga* (from *matj*, fish, and *renga* or *runga*, red, gay or coloured), also *tjutto massrenga* or little kingfisher, to distinguish it from the following species. All the specimens which I have seen from Bengal are distinguished by somewhat brighter or purer colours from the European ones which I have had an opportunity of seeing, two of which were shot here in Skania in 1835 and 1836. This is evidently an effect of the warmer climate, but besides this, the Bengalese ones always have smaller though not shorter feet than the European ones. This may probably arise from the greater warmth, which has more rapidly and completely dried up the soft parts in fresh-stuffed specimens in India than in Europe. The resemblance is too great for one to assert any specific difference.

52. *Alcedo smyrnensis*, L. et auct., et ejusd. var. γ . Lath. (var. β . dist. sp.). Gen. Halcyon, Swains.

Castanea, collo antico (ad medium pectus) albo, dorso alis caudaque cæruleis, vitta cubitali nigra. Macroura rostro recto pedibusque sanguineis.

♂ (d. 12 Mart.). Alarum tectrices mediæ nigrae, fasciam obliquam formantes; minimæ castaneæ, maximæ colore dorsi. Scapulares sordide cærulei. Remiges 3–5 subæquales, reliquis longiores; omnes primariæ apice nigrae, pogonio interno albo; cubitales 14, quarum 12 æquales, intus nigrae. Cauda rotundata, longit. trunci, subtus nigra. Tibia apice vix nuda. Lingua parva, triangularis, apice rotundato, integerrimo. 10½ poll. Ala 118 mill. Pes e talo ad apicem unguis 40. Rostrum e fronte 60, altit. 15, cauda 76. Alius ♂ (mense Apr.) simillimus, præter alam 115 millim., rostrum 55, caudam 80. ♀ similis mari.

This is certainly one of the handsomest of birds, in respect both of the splendour of the colours and their pleasing distribu-

tion. The chestnut-brown body and snow-white throat, together with the splendid blue of the back, wings and tail, form an uncommonly beautiful whole, which is especially admirable in the living bird when it expands the wings. When the skin is dried, somewhat of the brilliancy of colour is lost, which is the case with most high-coloured birds. This species occurred not rarely about Calcutta. It dwells in the higher trees, or the summits of bamboos, in the vicinity of water, from which it may perhaps procure small fish, though the chief food seems to consist of insects. The stomach, which is very thin, almost membranous, was always found full of grasshoppers and crickets, without any remains of fish. This bird flies tolerably quick, somewhat like a woodpecker, and betakes itself to a greater distance when disturbed, over the tops of the trees, without regard to the vicinity of water.

It seems to be stationary near Calcutta, and was seen in pairs in April. The voice was not heard. The Bengalese name is *borra matchrenga* or *great kingfisher*. In Latham's 'Gen. Hist.' the name given is *Paula gumma*.

53. *Alcedo capensis*, L. et auct.—Gen. *Halcyon* recentiorum.

Pallide fulvescens, superne sordide cærulea, capite nuchaque cinereis; dorso oblecto nitide cyaneo. Rostrum rubrum, apice recto dorsi carina planata*.

♂ (Serampore d. 25 Febr.). Iris rufo-grisea. Pedes rubri. Gula albida. Corpus subtus lineolis fuscis, tenuissimis transversim undulatis. Alæ et cauda nitide cinereo-cæruleæ. Long. 14 poll. Ala 150 mill.; pes e talo ad apicem unguis 50; cauda 106; rostrum e fronte 81; altit. 20. Rostrum crassum, compressum dorso rectissimo, sutura adscendente. Remiges 1–3 gradatæ; 4^a ceteris longior. Lingua brevissima (12 millim.), obcordata, basi ut vulgo sagittata extorsum dilatata, apice profunde incisa, laciniis obtuse rotundatis!

I only saw the specimen described, which was found sitting on a post, at a large water-tank. The stomach, which was very thin, was empty, but smelt strongly of fish. The form of the body seemed to be somewhat more slender than in the foregoing species. The perfectly heart-shaped form of the tongue is unusual among birds†.

* *A. leucocephala*, Gm., c Java, huic simillima, differt collo toto, etiam nucha, testaceo, et magnitudine paulo inferiore. An vere dist. sp.?

† The bird above described is the *Halcyon brunnicaps* of Jerdon, a name which, if the species be a good one, may be retained in preference to *capensis*, which implies an error of locality. But the Indian birds are so closely allied to the *H. leucocephala* of the Malay countries, which only differs in the crown being pale tawny instead of brown, that I can hardly venture to separate them. The hind neck is testaceous in both species.—H. E. S.

54. *Alcedo rudis*, L. et auct.

Nigra et alba, cauda mediocri, rotundata; capite subcristato; dorso, fasciaque pectoris nigris; superciliis albis. Rostrum et pedes nigri. Præcedente paullo minor (secundum adnotationem ex individuo vivo d. 23 Martii).

Although this bird occurred during all the time that I remained in Bengal, and in all the places which I explored, much more frequently than the two former species, it happened that I procured no specimen of it. I have not therefore thought fit to give a lengthened description, especially as I have seen none in collections which certainly came from Bengal. According to a note made on the spot, upon one which was seen at a very short distance, once when I was unarmed, the beak seemed to be considerably thicker than in the specimens which I have since seen in collections, and curved upwards as in the previous species. The bird kept near the river and the tanks, partly in trees, partly walking on the ground, and was often seen to hover in the air in one place like the Kestrel over its prey. The tail was commonly carried erect, both when the bird sat still and when it walked, which was not observed in the two preceding kinds. Its note was a shrill *Tick!**

55. *Psittacus torquatus*, Kuhl., Act. Bonn. x. (sec. Brisson).—*Ps. alexandri* var. β , L. *Palæornis cubicularis*, Wagl. *Monogr. Psitt.* p. 45.

Viridis, ala immaculata, torque nuchali tenui roseo. Gula cum stria laterali, torquem limitante, striolaque loræ nigris; rostro sanguineo (adultus).

♂ (d. 10 Febr.). Occiput paullo cæruleo tinctum. Rectrices apice cærulescentes, intus subtusque flavæ. Rostrum totum rubrum. Iris alba. Palpebræ (nec orbita) nudæ. Long. 16 poll. Ala 165 millim. Rectrices mediæ 252, extimæ quadruplo breviores.

Our want of information from India is especially shown by the fact that the existence of this Parroquet was denied in the last treatise on these birds which I am acquainted with, viz. Wagler's excellent monograph in the 'Abhandlungen der Bayerischen Akademie,' Munich, 1835. According to my experience this is the only species of Parroquet which is really common about Cal-

* This Indian species, to which I have given the name *Ceryle varia*, differs from *C. rudis* of S. Europe and Africa in the greater amount of white on the upper parts, but it is absolutely identical in form and structure with *C. rudis*. I have seen the latter species at Smyrna hovering in the mode described by M. Sundevall, but I never saw it *walking*, nor was I aware that any of the *Alcedinidæ* (in which the feet are remarkably short and feeble) ever made any progress upon the ground.—H. E. S.

cutta. It was often seen from February to April, in small flocks of five to seven together. These commonly showed themselves during flight by their well-known scream, which in the open air resembled the note of a Jackdaw, somewhat like *tjeh* ! They were seen both sitting in trees and walking on the ground in quest of food, which consists of rice, fruits, &c. The flight is very strong and steady, often high above the tops of the trees, and they are frequently seen to fly over the town of Calcutta. The screaming of such a small flock flying overhead was the first bird-note which greeted me as I ascended the river to Calcutta. They were recognised by their voice to be parrots, which I should not perhaps have otherwise guessed, as we are accustomed to consider these birds as very poor fliers. They are very wary and shy, so that it is not easy to shoot them. I consequently only got one, the female above-described, but one often sees them in cages, in all the shops and bazaars ; and in the country houses parrots, chained by the foot to a large suspended ring, form a frequent ornament, and this species occurs incomparably the commonest. The price too is lower than that of the other species ; they may be bought for one or at most two rupees. These caged Parroquets commonly flutter and scream so, that in a large bazaar one can hardly hear a person speak ; they often get loose, and one may frequently see them hanging by their chain, unable to help themselves up. They are always taught to speak some words, as was the custom even before Alexander's time. It is remarkable that even the Americans, before the arrival of Europeans, knew how to teach parrots to talk, and Humboldt records (in his ' *Ansichten der Natur* ') a bird of this kind, obtained from one of the small tribes of South America, which spoke a language unknown to the present inhabitants of that country, it having belonged to a tribe which a short time before had been exterminated. The Bengalese name of *P. torquatus* is *Thée* (the *th* pronounced as in English). This is evidently the species which Pliny describes (lib. 10. cap. 42) as coming from India, but the first Parroquet which came to Europe during Alexander's expedition to India was probably *P. alexandri*, which differs from this, in having a red spot on the wings and in its larger size.

56. *Psittacus bengalensis*, Gm., Kuhl.—*Palæornis bengalensis*, Wagl. *Monogr.*

Viridis, capite pallide roseo, postice cærulescente ; torque tenui gulaque nigris. Macula alarum antica obscure rubra.

♂ (d. 12 Febr.) maxilla superior fulva, inferior nigra. Orbita anguste nuda, et iris albæ. Corpus subtile paullo dilutius. Priori minor : ala 137 mill., cauda minus elongata.

This also occurs around Calcutta, but less common than the last species, and I cannot positively assert that I have seen them wild. The specimen described was obtained from a friend. This species is not often seen in a captive state, and it is charged higher than *P. torquatus*. I could learn no other name for it than *kolkottia*, which is much like that of many other species of small birds, e. g. *Lanius superciliosus*.

57. *Psittacus melanorhynchus*.—*Palæornis melanorhynchus*, Wagl.

Viridis, capite rubicundo-cinerascente; mento, macula magna genarum, strisque loræ nigris. Alarum tectrices mediæ flavescentes. Collum antice rubicundum. Rostrum nigrum. An *Ps. pondicerianus*, junior?

Of this species I only saw one specimen, which a Hindoo boatman had sitting in a ring on board his boat. He assured me that he had caught it near Serampore, and a trustworthy well-known Hindoo asserted on the same occasion that he had seen many of these Parroquets from that country.

Obs. Many other Asiatic, Javanese and Australian Parroquets were seen in the shops of the natives, or were carried about for sale. Many of them were said to have been caught in Bengal, but as I did not procure any further information on this point, little attention was given to these assertions. *P. sulphureus* often occurred at the price of six or eight rupees, and was generally named from its note, *kakatua*. A dealer wished to persuade me that this species also was caught far in the interior of Bengal, as he understood from my question that I chiefly valued the productions of that country. It was offered me for five rupees.

The large green species with a short tail are called *Hüdamon*; among which I recognised the American *P. æstivus*.

Lories, or the red species with short tails, were called *Nuri*, which is probably the original Indian word, from which Europeans have formed the name Lory. Edwards says (under pl. 170) that he borrowed the name Lory from Nieuhoff. According to Scaliger (see Wagl. Monogr. p. 13) the name *Nor* is derived from the island Badang near Java, and means *shining*. These birds are said not to occur near Calcutta, but to be brought thither from the interior. A common name for parrots is *Tottah* or *Tottaw*.

[To be continued.]

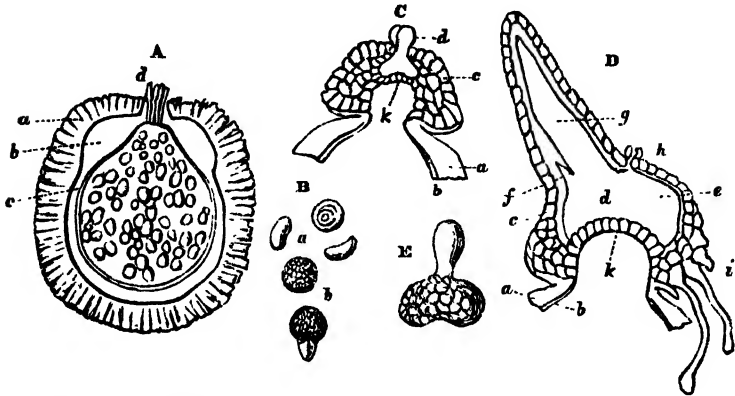
XLV.—On the Fructification of the Rhizocarpeæ.

By M. J. SCHLEIDEN*.

FOR the development of a new individual in *Rhizocarpeæ*, two very distinct parts separate from the old plant, namely pollen grains and ovules. The former have the usual structure, consisting of a cell (the pollen-cell) and the outer pollen membrane. The ovules exhibit the following structure: a very large, firm-walled cell, containing very large starch granules, mucilage and oil (the embryo-sac), is inclosed in a white coriaceous membrane, which is formed of cells so very small as to be almost indistinguishable; this membrane forms a papilla (the nucleus) at one end, which is sometimes clothed either by three lobes of the same membrane as in *Salvinia*, or by an envelope composed of these three lobes united together so as to leave an orifice at the apex as in *Marsilea*; this is called the simple coat of the ovule (*integumentum simplex*). The whole is inclosed in a cellular sac (*sacculus*) as in *Salvinia*, or surrounded by a layer of quite gelatinous and almost confluent cells, as in *Pilularia* and *Marsilea*. The cell of the pollen grain extends itself into a longer (*Salvinia*) or shorter (*Pilularia*) tube. Simultaneously the cells of the nucleus develop toward the apex of the embryo-sac, become clearly distinguishable and more lax, filled with chlorophylle, &c., and break through the nucleus so that they project free (*mammilla nuclei*). If a pollen tube now comes in contact with these cells it penetrates deeply between them and reaches a layer of smaller green cells, immediately clothing the embryo-sac (*Pilularia* and *Salvinia*), and then expands as a vesicle; it thus displaces the surrounding cellular tissue, which however continues to develop and protrudes from the ovule as a larger or smaller green body; in *Salvinia* it elongates into two lateral, connected processes, while in *Pilularia* a portion of the cells of the upper surface extend themselves into long, hair-like fibres. In the utricular end of the pollen tube cellular tissue is developed, which, becoming the embryo, finally breaks through, with one end, the *mammilla nuclei* of the ovule, which now exhibits the appearance of a thin-walled sac; the latter on the occurrence of this process assumes the form of a round sheath (*Pilularia*), or a flat, bilabiate body (*Salvinia*). In *Salvinia* the protruding embryo forms a stem which spreads out above into a flat disc, floating on the water (*primary leaf, cotyledon*); from its point of attachment, at the lower part of a vertical fissure in it, a bud already somewhat developed produces into a little stem, bearing leaves on both sides and sending out radicles below. In *Pilu-*

* Translated by Arthur Henfrey, F.L.S., from Schleiden's 'Grundzüge der Wiss. Botanik,' 2 Th. p. 100.

laria the protruded end of the embryo develops into an upright green filament (*primary leaf, cotyledon*), at the base of which a bud, already formed, produces a stem with long filiform leaves. The opposite end of the embryo becomes a root and breaks through, somewhat later, the green *mammilla nuclei* of the ovule, which here also appears as a sheath.



Pilularia globulifera. *A*, Transverse section of an ovule at the commencement of development; *a*, gelatinous envelope; *b*, coriaceous coat; *c*, embryo-sac filled with starch and drops of oil; *d*, mammilla of the nucleus. *B*, Pollen grains; *a*, fresh from the pollen sac; *b*, swollen in water and at the commencement of the formation of the tube. *C*, Upper part of the ovule after the penetration of the pollen tube *d*; *a*, coriaceous coat; *b*, embryo-sac; *c*, nucleus and its mammilla; *k*, layer of cells which separate the pollen tube from the embryo-sac. *E*, Pollen tube from *C* prepared free; above it shows the still uncovered portion which was inclosed in the outer pollen membrane, in the middle the more slender special tube, and below the broad expanded part already filled with cellular tissue, which develops into the embryo. *D*, Upper end of the ovule in a further advanced stage of development; *a*, coriaceous coat; *b*, embryo-sac; *c*, nucleus and its mammilla, expanded by the development of the embryo into a sac; *d*, stem-end of the embryo (*e*); *g*, primary leaf (cotyledon); *h*, pollen tube; *f*, first axillary bud; *i*, capillary, outstretched external cells of the nucleus; *k*, layer of cells which separates the embryo from the embryo-sac.

BIBLIOGRAPHICAL NOTICES.

The Physical Atlas; a series of Maps illustrating the Geographical distribution of Natural Phenomena. By H. BERGHAUS, LL.D., F.R.G.S. &c., and A. K. JOHNSTON, F.R.G.S. &c.

It is with no small pleasure that we find ourselves called upon to notice this important undertaking, especially in the improved form under which it is here presented to the British world; the comprehensiveness of the design and the care which is bestowed upon its

execution are not only a presumptive evidence of the growing interest on the subject felt by the general public, whose extensive patronage alone can render the speculation remunerative, but are full of promise for the future progress of the study, since the clear and definite exposition of the state of our knowledge will serve as a solid basis for new investigation, and will point out to each special inquirer in the wide field of natural science how his labours may be rendered most directly beneficial to the general progress.

Although physical geography may be considered as a modern science, it can hardly be said to be in its infancy, for, like the sister science, geology, it is of such a nature that it could not exist as a distinct branch of study until it had obtained so many data from the results of the simple sciences, as enabled it to assume at once a high rank among the divisions of human knowledge. Like geology, in fact, physical geography must be regarded as a compound science, whose province is the generalization of facts furnished by the pure natural sciences, these two magnificent paths of philosophical inquiry parting as it were from a common point where we have to examine the mighty phenomena of existing nature which are unceasingly operating to affect the ever-changing face of the earth; while one recedes into the dark and unfathomed depths of time, the other leads us forward into the light spreading over the living world, and makes clear to us the wonders among which we dwell, the treasures that surround us, and in addition to the surpassing practical relations to human interests which such a course possesses, the intellectual pride of those who follow it is both encouraged and chastised as it feels its way step by step to a clear insight into the works around it, which are at once the proof of man's high destiny and the evidence of his insignificance.

It is at a happy period that this work makes its appearance among us; when the first of physical geographers is laying before us the great generalizations, the fruits of a life devoted to the personal investigation of the grandest of terrestrial phenomena. Now that the illustrious Humboldt is giving to the world his philosophic summary of the natural laws, and the interest in these speculations is so rapidly extending, it will be no small advantage to those whose opportunities have not admitted of their becoming acquainted with these matters, to meet with a work, in which the results of the labours of the sons of enterprise, the voyager, the traveller, naturalist, hydrographer, &c., are philosophically systematized by the more tranquil efforts of deductive science and presented in a tangible form; from which, by a careful study of a few maps comprehensible by any one of common intelligence and application, they may acquire an amount of knowledge which years of reading of the works in which the facts have hitherto been stored up would not have given so clearly, nor fixed so firmly in the memory.

Indeed an acquaintance with the subjects illustrated by these maps must ere long become a necessary part of an enlightened education, and much gratitude is due to Dr. Berghaus, the author of the original German work, and to Mr. Johnston, to whose skill and enter-

prise we owe the present improved edition, for the truly scientific spirit in which they have performed their task. If it were a question of utility alone, this Atlas should be in the hands of all who profess to teach geography.

The execution of the work is quite worthy of the subject. In the five Parts now before us, forming half the work, we have fifteen beautiful coloured maps, many of them containing a number of details on an enlarged scale, the size being imperial folio. Each Part contains three maps with descriptive text. The work is divided into the two general heads, Inorganic and Organic nature; the former including,—1. Meteorology and Magnetism; 2. Hydrology, and 3. Geology; the latter, Phytology and Zoology; but the maps are not published in any regular order.

Part the first contains,—1. a Physical Chart of the Atlantic Ocean, 2. a map of the Mountain Systems of Europe, and 3. a map of the Distribution of Plants in a horizontal and perpendicular direction. The last is based chiefly upon Humboldt's statistics, and exhibits also Schouw's twenty-five phyto-geographic regions, or tracts over which certain families of plants predominate; this is a very interesting map, and is made the more valuable by a quantity of statistical information; while the description contains a clear summary of the principal facts of the geography of plants recorded by various botanical travellers.

Part the second commences with a map of a similar character, exhibiting the range of some of the mammiferous families, namely, 1. Quadrumana; 2. Marsupialia; 3. Edentata, and 4. Pachydermata. The editors express the difficulties they have met with in this division of the subject, and account for what may perhaps appear to naturalists to be a meagreness of its details, by reminding us of the large number of maps which a complete view of the distribution of animals would require. We think they have done wisely in resolving to give a moderate amount of information *clearly* rather than to crowd the map with a greater abundance of minor facts, which would have involved at least the appearance of confusion, without any compensating advantage; for this map is amply sufficient for the general student, and it is obviously beyond the plan of this work to furnish all the facts which would be required by a naturalist pursuing a special inquiry.

Next comes a Hyetographic map of the world, exhibiting the statistics of the amount and periods of the fall of rain over the globe. The relative quantities of rain are indicated by depth of shading, while coloured lines mark the limits of the zones within which precipitation is periodical or constant. It is accompanied by tables of the annual amount of rain over the globe as ascertained at a great number of points in the old and new world, both in the tropics and the temperate zones.

The River systems of Europe and Asia, displays the boundaries and comparative extent of the river basins and the seas to which they contribute their waters; with hydrographic tables, &c.

Part the third presents us with,—1. a map of Glaciers and glacial

phænomena founded on the observations of Prof. J. D. Forbes, Charpentier, Raymond, &c., with a descriptive treatise by the first-named gentleman. 2. The distribution of Carnivora, with a map of the district inhabited by the fur-bearing animals, together with the region of the whale and seal fishing in the northern hemisphere. 3. A Physical Chart of the Pacific, with the navigation, currents, temperature, &c.

Part the fourth,—1. a highly interesting map illustrating the phænomena of Volcanic action as exemplified in the regions visited by earthquakes and the distribution of volcanoes, accompanied by an extensive table of the geographical distribution of volcanoes, giving their position, date of eruption, height in feet, and the name of the "system" to which they belong. 2. a Rain map of Europe. 3. the Geographical distribution of Reptilia; one section given to the Testudines, Sauria and Batrachia, two others illustrating the positions of the Ophidia, innocuous and venomous, according to Schlegel, with tables showing the numbers and distribution over the globe and in the zoological provinces of that author.

Part the fifth,—1. a map of the Geographical distribution of Birds in two sections,—1, over the Globe; 2, over Europe. The data for the division and intensity of species in the first are furnished by Pomper's classification, arranged according to Cuvier's system; in this way the globe is divided into sixteen provinces, which are arranged into three groups according to the zones.

The divisions are altered in the general map in regard to Europe, which is made one undivided province. The orders taken in the general map are,—1. Rapaces; 2. Scansores; 3. Oscines; 4. Gallinacæ; 5. Grallatores, and 6. Natatores; and the table of distribution shows that while in general the number of species is greatest in tropical countries, Europe forms such a striking exception, that it possesses more species than any other province except that of tropical America, more even than tropical Asia and the Sunda Islands together; but the gross number increases in the tropical provinces, and this holds good of all the single orders except that of the Natatores, this order decreasing toward the equator. Europe and tropical America possess the greatest number of Rapaces, while Scansores and Oscines predominate in the latter; Grallatores and Natatores are most numerous in Europe, and the greatest number of Gallinacæ occur in tropical Asia. There is also a table of the birds of Europe based on the 'Systematic Catalogue' of Keyserling and Blasius. On the map are, 1. elevations exhibiting the perpendicular range in general and in the Alps. 2. Mountain Chains of North America, with Humboldt's plan of the volcano of Jorullo and a map of the Island of Trinidad. 3. an Ethnographic map of Great Britain and Ireland.

The whole of the maps are most beautifully engraved and coloured with the greatest care, and full justice is done to those whose devotion and perseverance have rendered such a work possible; indeed we think that the scientific world owes much to Prof. Berghaus and Mr. Johnston for such a magnificent exposition of its labours, since

we can scarcely imagine anything better calculated than this Atlas to impress the general public with a true idea of the value and interest of scientific pursuits. The work must indeed be regarded as one of the most valuable gifts ever offered by science to education.

A History of Inventions, Discoveries and Origins. By Prof. BECKMANN. 4th ed. Edited by W. FRANCIS, Ph.D. &c., and J. W. GRIFFITH, M.D. &c.

From the title of this work it would at first appear that it had little to do with the subjects to which our pages are devoted, but under the third head, that of Origins, we find several articles which, although hardly to be considered as scientific, have considerable interest for the naturalist. The inquiries concerning the plants known to the ancients and the endeavours to settle their synonymy with modern species present a good example of the wonderful perseverance and earnestness which characterize German research even when its results are to be devoted to popular instruction.

In the article on the history of kitchen vegetables, the author, in addition to those commonly in use, refers shortly to several which are no longer considered worthy of cultivation. Speaking of the name of *Borago officinalis*, he says:—"Some of the old botanists have conjectured that it is derived from the word *corago*, which Apuleius, whose period is uncertain, gives as a synonym of *buglossum*. Some think that the reading in Apuleius ought to be *borago*; and others assert that *corago* is the true name, and arose from the quality which the plant has of strengthening the heart; consequently we ought properly to read *corago*, and not *borago*. It is probable that our forefathers, under the idea that their borage was the *buglossum* of the ancients and therefore had the property of strengthening the heart, threw the flowers into wine, that their spirits might by these means be more enlivened*.

"Our borage is certainly a foreign plant, and Cæsalpinus said that it was brought from other countries to Italy. Linnæus positively states that it first came from Aleppo; but I have not yet been able to find on what authority this assertion is founded."

There is a very interesting article on Kermes and Cochineal, containing a well-digested account of the æconomic history of these curious insects. It is stated that 1,569,120 lbs. of cochineal were exported from and consumed in this country in 1844, and that each pound contains 70,000 insects!

We do not quite agree with the editors in their opinion of plant-skeletons. This means of investigating structure, of stems especially, has been too much neglected, and is in fact almost the only means of acquiring a clear idea of relations of parts in some plants; such a means is the less to be dispensed with that we know so little of the subject. This book has been well-known in its former editions and its value fully appreciated, and great credit is due to the present

* Hence the old distich, "I, borage,
Give courage."

editors for the judicious emendations of and additions to the text. It affords no little gratification to the lovers of progress to see such works, prepared under careful superintendence, issued at a price within the reach of those who have hitherto had to content themselves with the second-hand compilations of the earlier "cheap literature."

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

Sept. 22, 1846.—William Yarrell, Esq., Vice-President, in the Chair.

John Gould, Esq., laid before the meeting the following letter, detailing the circumstances of the death of Mr. John Gilbert, who formerly had been many years in the employment of the Society. He fell in the service of zoological science during an expedition into the interior of Australia.

"Sydney, May 12, 1846.

"Dear Sir,—As I was one of the party that journeyed from Sydney to Port Essington, and not knowing whether you had been made acquainted with the full particulars of poor Gilbert's death by Dr. Leichhardt, or any other of the party, thinking the details of his melancholy fate would be read with interest, I shall offer no apology for addressing this to you.

"As Mr. Gilbert's log, which has been sent home to you, fully narrates all particulars up to the eventful 28th of June, I shall offer no remarks of my own. At the most northerly point we reached on the east side of the Gulf of Carpentaria, in lat. $15^{\circ} 57'$, and about fifty miles from the coast, we encamped for the night at a small shallow lagoon surrounded by low tea-trees, the country around beautifully open. Having partaken of our usual meal of dried meat about 3 P.M., Gilbert, taking his gun, sallied forth in search of something new—he procured a *Climacteris* and a Finch, which he skinned before dinner; our scanty meal was soon despatched; poor Gilbert was busily employed plaiting the cabbage-tree, intending to make a new hat, which, alas! he never lived to finish. The shades of evening closed around, and after chatting for a short time we retired to our separate tents—Gilbert and Murphy to theirs, Mr. Calvert and myself to ours, and Phillips to his; the Doctor and our two black fellows slept round the fire, entirely unconscious of the evil designs of the natives; having always found those we had passed so friendly and well-disposed, we felt in as great security as you do in the midst of London, lying on our blankets, conversing on different topics. Not one, I think, could have closed his eyelids, when I was surprised by a noise, as if some persons were throwing sticks at our tent; thinking it must be some trick played on us by our companions, I sat up to look out; another volley of spears was thrown; a terrific yell, that will ring in my ears for ever, was raised, and pierced with spears, which I found it impossible to extricate, I sunk helpless on the ground; the whole body rushed upon us with their waddies,

and how it is that our brains did not bespatter the ground is to me miraculous. These rascals had crept on us under cover of the tea-trees: the tent in which Calvert and I were being first in their road, the whole body attacked us; poor Gilbert, hearing the noise, was rushing from his tent with his gun, when a spear thrown at him pierced his breast, and, penetrating to his lungs, caused internal hæmorrhage; the only words he spoke were these, 'Charlie, take my gun; they have killed me,' when pulling the spear out with his own hands, he immediately dropped upon the ground lifeless. Little Murphy, who was by his side at the time he was speared, fired at the black fellow who speared him; Brown fired at the mob beating Calvert and myself, and they immediately retreated howling and lamenting. Mr. Calvert was pierced with five spears, myself with six, and our recovery is to be attributed to the abstemious way in which we lived. After having the spears pulled out, you may imagine our feelings when we heard Charlie exclaim, 'Gilbert is dead!'—we could not, would not, believe it. Alas! the morning brought no better tidings—poor Gilbert was consigned to his last and narrow home; the prayers of the church of England were read over him, and a large fire made upon his grave for the purpose of misleading the blacks, who, we thought, would probably return and search the camp on our departure. It is impossible to describe the gloom and sorrow this fatal accident cast upon our party. As a companion, none was more cheerful or more agreeable; as a man, none more indefatigable or more persevering; but it is useless for me to eulogize one so well-known to you—one whom you will have cause to regret, and who will ever be remembered by,

"Sir,

"Yours most truly,

"JOHN ROPER."

The skull of a Seal was exhibited to the meeting, presented by the Society's Corresponding Member, Richard Hill, Esq., who refers to it in a letter, dated Spanish Town, Jamaica, July 8, 1846, as "a skull of an undescribed Seal found on the islands and shoals called by the seamen the Pedros, but known as the Vibora Bank on the old Spanish charts, situated about a degree to the south of Jamaica."

Mr. Hill's letter proceeds: "The most detailed account I can give of this Seal, in addition to the facts presented by an inspection of the cranium, which will be found to have much of the contour and character of that of the *Calocephalus* of Frederick Cuvier, will comprise little more than the statement that it has no external auricles: the foramina are so small that all trace of an ear to a casual observer is imperceptible. The colour of the animal is intensely and uniformly black; the hair is stiff and close, and very short; the nails of the hinder claws are rudimentary; the eyes are large, black and full, and the iris crimson.

"The measurements of the specimen from which the cranium sent was obtained, are the following:—

	ft.	in.
Total length along the back from the snout to the tip of the		
tail	4	2

	ft.	in.
Length of the tail	0	3
From the snout to the insertion of the fore-paw	1	6
From the insertion of the fore-paw to that of the hind-paw..	2	10
Circumference of the body near the fore-paws.....	3	2
Breadth of the back at the fore-paws	1	0
From one fore-paw to the other, extended out	2	6
Length of the fore-paw	0	10
Length of the hind-paw	0	11
Circumference at the hind-paws	1	6
Breadth of the head across the ears, horizontally measured..	0	7
Length of the head	0	9
Breadth of the nose	0	4½

"Other seals have been taken nearly, if not quite, double this size."

A paper was then read, "On a new Genus of the Family *Lophidae* (les Pectorales Pediculées, Cuv.) discovered in Madeira." By the Rev. R. T. Lowe, M.A., Corr. Memb.

The addition, Mr. Lowe observes, of an unequivocal new genus to a family so circumscribed and so singular as *Lophidae* is well-worthy of remark. The present genus has, besides, further claims on the attention of the ichthyologist in the peculiar combination of distinctive features of its own with characters exhibited by other groups in the same family; and this independent of the interest attaching to the fish in which they are exemplified, from singularity of form and aspect, brilliancy of colouring, locality, and extreme rarity, no other instance of its capture at Madeira having occurred during the last twenty years.

It is nearest allied amongst the groups of *Lophidae*, in general habit and aspect, with *Cheironectes*, Cuv., although in technical characters it may seem to approach even nearer to *Halieutæa*, Val.

The individual described was taken with an ordinary bait and line at the Picos, a rocky shoal about a league from shore off Camera de Lobos, a village five or six miles westward of Funchal.

CHAUNAX, nov. gen.

Char. Gen. Corpus subcubico-oblongum, sufflatabile, nudum, cute præsertim ad ilia ventremque flaccidissimâ laxâ; anticè obesum, posticè abruptè attenuatum subcompressum. Caput osseum magnum subtetrahedrum, supernè nuchâque latum planatum, utrinque S. ad genas declive; oculis lateralibus spatio interoculari convexo; ore rictuque amplissimis transversis plagio-plateis S. depressis. Dentes intermaxillares vomerinique palatinique parvi scobinati. Nares simplices (nec pedicellatæ nec tubulosæ). Spiracula (foramina branchialia) postica S. ad ilia pone pinnarum pectoralium axillas.

Pinna dorsalis unica; pectoralibus (pedicellatis) carnosis ventralibus jugularibus spathulatis carnosis; analis postica; caudalis simplex truncata.

Cirri, præter unicum in fossulâ internasali, nulli.

Chaunax pictus, Lowe.

D. 11; A. 5; P. 11; V. 4; C. $\frac{1+IV.}{2+II.}$

Species adhuc unica.

Hab. In mari Maderensi.

Shape thick and deep, subcubic, about half as deep as broad, with a puffy flaccid appearance, and evidently capable of vast inflation; bulky forwards, with the head, nape and body of equal depth and thickness, contracting suddenly on the flanks or behind the pectoral fins into a short thickish tail. Back of head and nape as far as the dorsal fin broad and thick, flattened and uneven or irregularly protuberant; thence to the end of the dorsal fin the body is nearly cylindrical, becoming compressed towards the root of the caudal fin.

Head broad and deep; eyes lateral; sides of the head steep, but not flat; mouth very large and wide, but not so wide as the head, horse-shoe or crescent-shaped. Teeth in a distinct brush-like band on the edges of both jaws. Tongue very large, thick, hard and smooth. The nostrils are two inconspicuous, minute, round, simple pores on each side, one a little before the other near the edge of the muzzle. Eyes of moderate size, roundish oval, rather prominent, but not pedicelled.

In the middle of the front of the muzzle is a short, pedicelled, soft, flaccid tentacle or caruncle scarcely more than a semidiameter of the eye in height or length, the whole body destitute of any other tentacle, ray, filament or spine whatever; the top of the head is however irregularly knobbed, or uneven, with bony prominences and depressions.

The breathing-holes or branchial orifices are placed far backwards, considerably behind the hinder axils of the pectoral fins, in the middle of the flanks, which are peculiarly flaccid and flabby. They are oval, ear-shaped, and about the size or diameter of the eyes.

The dorsal fin is single, placed nearly in the middle of the whole length, its height one-fourth of the length of its base.

The anal fin is placed far behind, opposite the end of the dorsal.

The pectoral fins are placed low down about the middle of the length of the body, beneath the origin of the dorsal fin.

The ventral fins are close together, very forward, quite under the throat.

Caudal fin simple, truncate, with a straight edge.

All the fins, except the dorsal and caudal, are thick and fleshy, with the rays strong but indiscernible to the eye, except towards the outer edges of the pectoral fins.

The whole head and body, with the maxillaries and the rays of the dorsal and caudal fins, are finely hispid or shagreened, and rough and scabrous to the touch, the under surface more finely shagreened than the upper.

The whole skin is singularly loose and flaccid. The head and body are, as it were, mapped out into compartments by remarkable chain-like rows of pits or oblong, shining, smooth depressions in the skin. One set or row of these begins upon the muzzle, and passing

above each eye, turns downwards behind it and runs on a level with its lower edge straight along the sides as far as the breathing-holes, thence downwards along the tail to the caudal fin.

Under the lower jaw is a horse-shoe-shaped space enclosed by similar smooth pits, the two ends of which, connected by a transverse chain of pits, turn off backwards towards the corners of the mouth, and continuing low down on the sides of the belly, end underneath the axil of the pectoral fins.

A third wavy line runs along the inner or hinder edges of the maxillaries, and turning obliquely backwards some distance underneath the eye, descends till it meets and is terminated by a fourth obliquely vertical row which crosses the nape like a head-stall, and is terminated low down on the sides of the throat by the second longitudinal line. On the nape the edges of these pits are raised or echinulate, and more disconnected than elsewhere.

Colour of the whole fish above bright orange, beautifully rosy at the flanks and sides, and with the fins and lips vermilion; on the belly it is nearly white or pale, suffused with flesh-colour or rosy, and with the ventral or anal fins deeper vermilion.

The tentacle dull, its stalk orange.

MEASUREMENTS.		inches.
Whole length.		16
From tip of upper jaw to origin of dorsal fin		6
Length of base of dorsal fin		4
Length from end of base of ditto to root of caudal fin. . .		2
Length of caudal fin		3 $\frac{1}{4}$
Length of head		5
Breadth, greatest at fore axil of pectoral fins, from . .	8 to 10	
Depth, greatest half-way, the tip of upper jaw and origin of dorsal fin		4
Depth at root of caudal fin		1
Length from tip of lower jaw to root of ventral fins . . .		4
Length of ventral fins		2 $\frac{1}{4}$
Length from each breathing-hole to root of caudal fin. . .		5
Diameter of eyes		0 $\frac{3}{4}$

Mr. Gould then exhibited to the meeting two new Australian birds, which he characterized as follows:—

MELIPHAGA LONGIROSTRIS. *Vertice et genis nigris; plumis minutis ad basin mandibulae superioris, mystacibus ad basin inferioris mandibulae, strigis superciliari, plumarum cristula post aures, plumisque in jugulo setosis, albis.*

Top of the head and cheeks black, with minute white feathers on the forehead round the base of the upper mandible; a superciliary stripe, a moustache at the base of the lower mandible, and a small tuft of feathers immediately behind the ear-coverts white; feathers on the throat white and bristle-like; upper surface brownish black, becoming browner on the rump; wings brownish black, the outer edges of the quills margined at the base with beautiful wax-yellow, and faintly margined with white towards the extremities;

tail brownish black, margined externally at the base with wax-yellow, and with a large oval spot of white on the inner web, at the tip of all but the two centre feathers; surface white broadly striped with black, the black predominating on the breast and the white on the abdomen; irides white; bill and feet black.

Hab. Western Australia.

Total length, 7 inches; bill, 1; wing, $3\frac{1}{4}$; tail, $3\frac{1}{2}$; tarsi, $\frac{3}{4}$.

Remark.—Nearly allied to the *M. Novæ-Hollandiæ*, but differing from that species in the stouter and more lengthened form of the bill, and in having the white patch on the face much less defined.

LIMOSA MELANUROIDES. Capite, et corpore superiore griseo-fuscis; primariis secundariisque ad basin et tectricibus alæ majoribus ad apicem albis, colore, expansæ pennæ, tanquam fasciæ apparente; tectricibus caudæ superioribus albis; caudæ utrâ, nisi rectricibus lateralibus duabus ad basin albis.

Head and all the upper surface greyish brown, with a small streak of black down the centre of the feathers; wings dark brown; shafts white; base of the primaries and secondaries and tips of the greater coverts white, forming a band when the wing is expanded; upper tail-coverts white, forming a conspicuous mark; tail black, with the exception of the two lateral feathers on each side, which are white at the base and black at the tip; neck, breast and flanks greyish brown; abdomen and under tail-coverts white; irides brown; bill greenish grey, becoming paler on the sides of the upper mandible; legs and feet greenish grey.

Total length, 13 inches; bill, $3\frac{3}{8}$; wing, $7\frac{5}{8}$; tail, $3\frac{1}{4}$; tarsi, $2\frac{5}{8}$.

Hab. Port Essington.

Remark.—Nearly allied to, but differing from, the *Limosa melanura* of Europe in its much smaller size.

October 13.—William Yarrell, Esq., Vice-President, in the Chair.

The following papers were read to the Society:—

“On twenty new species of TROCHILIDÆ or Humming Birds.”
By J. Gould, F.R.S.

Having lately turned my attention to the *Trochilidæ*, I find that, much as this beautiful group has attracted the notice of previous writers, several species remain undescribed.

At a former meeting of the Society I characterized three, and on the present occasion I propose to describe seventeen others, making twenty in all. The species described are contained in my own collection.

1. *TROCHILUS (TOPAZA) PYRA. Troch. abdomine, lateribus, dorso, humerisque, igneis rubro-fulgentibus; capite, auribus, nuchâ, et fasciâ inferiorem collum ornante, intensè atris; guldâ luminosè viridi, mediâ aurantiacâ; rectricibus intermediis duabus viridibus, purpurascens, reliquis autem intensè purpureis; rectricibus duabus intermediis proximis valdè elongatis et ad bases decussatis.*

Abdomen, sides, back, and shoulders, luminous fiery-red; head, ear-coverts, back of the neck, and a band crossing the lower part of

the neck, deep velvety black; throat luminous pale green, passing into rich orange in the centre; two centre tail-feathers purplish green, the remainder deep purple, the feather on each side the centre ones much-elongated and crossing each other near the base; upper tail-coverts luminous light green with red reflexions; under tail-coverts luminous green; primaries purplish brown; bill black; feet blackish brown.

Total length from the tip of the bill to the end of the centre tail-feather, 6 inches; to the end of the elongated feathers, $8\frac{3}{4}$; bill, $1\frac{1}{2}$; wing, $3\frac{1}{2}$; tail, $2\frac{3}{8}$, of the elongated feathers, $4\frac{5}{8}$.

Hab. Rio Negro, Brazil.

Remark.—I consider this to be without exception the most gorgeous species of the Trochilidæ yet discovered. It is somewhat larger than, but of precisely the same form as, *T. pella*, which fine species it far exceeds in the brilliancy of its colouring, and from which it is at once distinguished by the fiery lustre of its body and the purplish colouring of its tail-feathers.

2. *TROCHILUS (LESBIA) SMARAGDINUS.* *Troch. vertice fulgente viridi; guld nitente cæruleo; caudæ perlongæ, furcatæ, fulgentissimè metallicè viridi; pogoniis rectricum externarum utrisque ad basin et internis reliquarum pogoniis nigris.*

Crown of the head luminous green; throat shining steel-blue; body green, the under surface with a golden tinge; tail very long and forked, metallic green and very luminous; basal portion of both webs of the outer feathers and the inner webs of the remainder black; wings brown; bill black.

Total length, $7\frac{1}{2}$ inches; bill, $\frac{3}{4}$; wing, $2\frac{3}{4}$; tail, 5.

Hab. Bolivia.

Remark.—This beautiful species is nearly allied to the *Ornismya Kingii*, Less.

3. *TROCHILUS (LESBIA) GRACILIS.* *Troch. guld nitente metallicè viridi; caudæ perlongæ valdè furcatæ; rectricibus externis aneo-fuscis, aneo colore ad splendentem maculam cujusque in apice plumæ fulgentiore, pogoniorum externorum dimidio basali cervino; reliquis rectricibus aureo-viridibus ad basin fuscis.*

Throat beautiful shining metallic green; the remainder of the body golden-green; wings brown; tail very long, much-forked; the outer feathers bronzy brown, the bronze gradually increasing in intensity and becoming a brilliant spot at the tip; basal half of the outer webs buffy white; remaining feathers brown at the base and shining golden green for the remainder of their length; bill black.

Total length, $6\frac{1}{2}$ inches; bill, $\frac{1}{2}$; wing, $2\frac{1}{4}$; tail, $4\frac{1}{2}$.

Hab. Peru.

Remark.—This species is very closely allied to the *Trochilus Gouldii*, Lodd., vide Proc. of Comm. of Sci. and Corr. of Zool. Soc., part 2, p. 7, which is synonymous with the *Ornismya Sylphia*, Less., but from which it differs in several characters, which upon an examination of many specimens, are found to be constant; the bill is

shorter, the green of the body ochreous, and the lower part of the abdomen more buffy, or not so green as in the *Gouldii*: the most remarkable difference, however, is in the outer tail-feathers, which are much narrower and not so green. By some ornithologists this might be considered as a mere local variation; but as I have seen many of each kind, and find that the differences are constant, I feel assured that the two birds are specifically distinct.

4. *TROCHILUS (OCREATUS) RUFOCALIGATUS*. *Troch. gulá et collo superiore fulgentibus metallicè viridibus; tarsi densis plumis ferrugineis ocreatis; caudá fuscá, rectricibus externis prolongatis angustis latæ tamen spathulæ formâ terminatis.*

Throat and fore-part of the neck luminous metallic green; plumage of the body bronzy green; wings brown; tarsi clothed with a thick ruff of rusty-red feathers; tail brown, the outer feathers prolonged and narrow, and ending in a broad spatulate tip; bill black.

Total length, $4\frac{1}{2}$ inches; bill, $\frac{3}{4}$; wing, $1\frac{3}{4}$; tail, $2\frac{1}{2}$.

Hab. Bolivia.

Remark.—Nearly allied to the *Ornismya Underwoodii*, Less.

5. *TROCHILUS (OCREATUS) LIGONICAUDUS*. *Troch. facie, collo superiore et pectore viridibus, plumis pectoris majoribus, fulgentioribus, griseo nonnunquam fimbriatis; medio abdomine aurco-fusco; uropygio fasciá albo-cerviná transversim ornato; caudá purpurascēte fuscá, fasciá latá per mediam straminē; rectricibus lateralibus primo diminuentibus, latis autem tanquam spathulis terminantibus.*

Face and forepart of the neck green, which colour is continued on the chest, where the feathers become larger, longer, more luminous, and some of them edged with grey; centre of the abdomen golden brown; lower part of the abdomen and under tail coverts buffy brown; wings purplish black; back and upper tail-coverts green, the rump crossed by a band of buffy white; tail purplish brown, with a broad stripe of buff down the centre; the lateral feathers tapering and terminating in a large spatulate tip; bill black.

Total length, $4\frac{1}{2}$ inches; bill, $\frac{5}{8}$; wing, $1\frac{7}{8}$; tail, $2\frac{1}{4}$.

Hab. Brazil.

Remark.—Nearly allied to *Trochilus platyrus*.

6. *TROCHILUS (—?) CUPRICAUDA*. *Troch. gulá luminosè cæruleo-viridi; vertice, collo, dorso, omnique corpore superiore fulgentibus saturatè purpureo-fuscis; caudá infrâ fulgentissimâ æned, suprâ, æned vario lumine nunc viridi, nunc purpureâ, splendente.*

Throat lustrous blueish green; crown of the head, neck, back and all the upper surface dark lustrous purplish brown; wings the same, but lighter; under surface of the tail rich fiery copper colour and very luminous; upper surface in one light rich purplish copper colour, and in another greenish; bill black.

Total length, 5 inches; bill, 1; wing, 3; tail, $2\frac{1}{4}$.

Hab. Bolivia.

Remark.—This species is much larger, but belongs to the same

section as the *Trochilus smaragdinicollis* of D'Orbigny and the *T. Allardi* of Bourcier.

7. *TROCHILUS* (— ?) *ÆNEOCAUDA*. *Troch. guld viridi metallicè fulgente; corpore viridi fusco suprà commixto; alis fuscis purpurascensibus; caudà infrà fulgente æneo-viridi, suprà metallicè fusca, nonnunquam intensè cyaneâ resplendente.*

Throat luminous metallic green, under surface mingled green and brown; upper surface green, wings purplish brown; under surface of the tail luminous brassy green; upper surface of the tail metallic brown, changing in some lights to deep indigo blue; bill black.

Total length, $4\frac{3}{4}$ inches; bill, 1; wing, $2\frac{1}{2}$; tail, 2.

Hab. Bolivia.

Remark.—Belongs to the same section as the last.

8. *TROCHILUS* (— ?) *VIOLIFER*. *Troch. vertice, nuchâ, mento, loris, pectoreque viridibus; mediâ guld maculâ semilunari luminosè violacèâ notatâ; dorso et uropygio aureo-viridibus abdomine inferiore, tectricibus caudâ superioribus inferioribusque, et caudâ rufis.*

Crown of the head, back of the neck, chin, ear-coverts, and breast green; on the centre of the throat a well-defined lunate mark of luminous violet; back and rump golden green; lower part of the abdomen, the upper and under tail-coverts light rufous; tail light rufous, the tips of the feathers washed with greenish reflexions; wings purplish brown; the external edge of the first primary rufous; bill black.

Total length, $5\frac{1}{8}$ inches; bill, $1\frac{5}{8}$; wing, 3; tail, $2\frac{1}{4}$.

Hab. Bolivia.

Remark.—This fine species is of the same form as the *Ornismya Bonapartei*.

9. *TROCHILUS* (*LAMPORNIS*) *CYANOPECTUS*. *Troch. guld viridi metallicè resplendente; medio pectore fulgente metallicè cyaneo; capite, dorso, humeris, lateribus, et abdomine inferiore æneo-viridibus; caudâ æneo-fusca nonnunquam pogoniis internis albâ maculâ ad apicem ornatis.*

Throat lustrous metallic green; centre of the breast deep lustrous metallic blue; head, back, shoulders, flanks, and lower part of the abdomen bronzy green; wings purplish brown; tail in some specimens entirely bronzy brown, in others bronzy brown with a spot of white on the inner web at the tip; bill black, curved stout and large for the size of the body.

Total length, $4\frac{3}{4}$ inches; bill, $1\frac{3}{8}$; wing, $2\frac{3}{4}$; tail, $1\frac{3}{4}$.

Hab. Venezuela.

Remark.—This bird is about the size of *Trochilus mango*, but is not intimately allied to any known species.

10. *TROCHILUS* (*LAMPORNIS*) *AURESCENS*. *Troch. guld fulgente aured; pectore latâ fasciâ rufâ, fronte vitâ lucidâ cæruleo-viridi cinctâ; omni superiore corpore, rectricibus intermediis duabus, tectricibus alarum superioribus inferioribusque, et abdomine æneo-*

viridibus; alis fuscis purpurascens; rectricibus lateralibus castaneis fuscis, infrà et suprà ad apices æneis; tectricibus caudæ inferioribus saturatè cervinis.

Throat rich luminous gold colour; across the chest a broad band of deep rufous; on the forehead a narrow stripe of shining blueish green; all the upper surface, two central tail feathers, upper and under wing-coverts, and abdomen bronzy green; wings purplish brown; lateral tail feathers chestnut-brown, tipped both above and beneath with a bronzy lustre; under tail-coverts deep fawn-colour; bill black.

Total length, 4 inches; bill, 1; wing, $2\frac{1}{4}$; tail, $1\frac{1}{2}$.

Hab. Rio Negro, Brazil.

11. *TROCHILUS* (LAMPORNIS?) *FULVIVENTRIS*. *Troch. capite, omni corpore superiore, caudâque nitente viridibus; rectricibus externis ad apices albis; alis fuscis; gulâ, pectore et abdomine cervinis; tectricibus caudæ inferioribus albis.*

Head, all the upper surface and tail glossy green; the outer feathers of the latter largely tipped with white; wings brown; throat, breast and abdomen deep buff; under tail-coverts white; upper mandible and point of the lower black; the remainder of the under mandible buff.

Total length, 4 inches; bill, 1; wing, $2\frac{3}{8}$; tail, $1\frac{1}{2}$.

Hab. Venezuela.

12. *TROCHILUS* (—?) *NIGROFASCIATA*. *Troch. gulâ resplendente viridi; abdomine humerisque extremis nitidè cæruleis, ab viridi gulâ fasciâ semilunari intensè atrâ divisâ; caudâ furcatâ cæruleâ.*

Throat lustrous green; abdomen and edge of shoulders shining-blue, separated from the green of the throat by a lunate band of black; back and wing-coverts brownish green; head and back of the neck bronze; wings brown; tail, which is considerably forked, dull steel-blue; bill black.

Total length, $4\frac{1}{4}$ inches; bill, $\frac{7}{8}$; wing, $2\frac{3}{8}$; tail, $1\frac{7}{8}$.

Hab. Rio Negro, Brazil.

Remark.—Nearly allied to *Trochilus furcatus*.

13. *TROCHILUS* (—?) *RUFICEPS*. *Troch. vertice ferrugineo; gulâ fulgente æneo-viridi; corpore viridi, infrâ fusco-tincto; caudâ magnd, furcatâ, æneâ.*

Crown deep rusty red; throat lustrous bronze green; upper surface green; under surface brownish green; tail large and forked, and of a pure bronze; wings purplish brown; bill black.

Total length, $3\frac{3}{4}$ inches; bill, $\frac{3}{4}$; wings, $2\frac{1}{2}$; tail, 2.

Hab. Bolivia.

Remark.—This is much smaller, but nearly allied to *T. heteropogon*.

14. *TROCHILUS* (—?) *INORNATA*. *Troch. corpore superiore æneo-viridi, inferiore ad latera brunneo, æneo splendente; gulâ plumis ad apices cæruleis; alis caudâque æneis.*

All the upper surface bronzy-green; under surface brown, with bronzy reflexions on the flanks; feathers of the throat tipped with cærulean blue; wings and tail bronzy, all the latter tipped with buff; bill black.

Total length, $3\frac{5}{8}$ inches; bill, $\frac{5}{8}$; wings, $2\frac{1}{2}$; tail, $1\frac{1}{4}$.

Hab. Bolivia.

Remark.—This species is closely allied to the species called *Le Sabine* by the French, *Trochilus* —?

Hab. Bolivia.

15. *TROCHILUS (LOPHORNIS) REGULUS.* *Troch. plumis in vertice castaneo-fuscis valdè elongatis, acuminatis, ad apices viridibus; guld pectoreque luminosè viridibus, plumis ad colli latera elongatis, minus autem quam in Trochilo magnifico; fascià in uropygio albd; caudd castaneo-fuscd, plumis singulis æneo-viridibus fimbriatis.*

Feathers of the crown chestnut-brown, very much lengthened, carried to a point, and tipped with green; throat and breast luminous green; the feathers on the side of the neck elongated, but not to so great an extent as in *Trochilus magnificus*; back and abdomen green, with bronze reflexions; rump crossed by a band of white; tail chestnut-brown, each feather margined externally with bronzy green; wings purplish brown; bill light brown, darker at the tip.

Total length, $3\frac{3}{4}$ inches; bill, $\frac{5}{8}$; wing, $1\frac{3}{4}$; tail, $1\frac{1}{4}$.

Hab. Interior of Brazil.

Remark.—This beautiful species is nearly allied to the *T. ornata* and *T. magnifica*, but differs from them in the lesser development of the feathers of the sides of the neck and in the greater size of the crest, which is more largely developed than in any other species known.

16. *TROCHILUS (—?) HYPOLEUCUS.* *Troch. corpore superiore viridi; guld et corpore inferiore albis; rectricibus intermediis duabus viridibus, reliquis fuscis viridi splendentibus, ad apices albis.*

All the upper surface green; throat and all the under surface white; wings brown; two centre tail-feathers green; the remainder brown, glossed with green and largely tipped with white; bill black; base of the lower mandible paler.

Total length, $3\frac{5}{8}$ inches; bill, $1\frac{1}{2}$; wing, $2\frac{1}{4}$; tail, $1\frac{3}{4}$.

Hab. Bolivia.

Remark.—Nearly allied to *T. leucogaster*, Tschudi, and not far removed from *T. albirostris*, Auct.

17. *TROCHILUS (—?) HISPIDUS.* *Troch. omni corpore superiore æneo-fusco; auribus saturatè fuscis infrà et suprà lined cervind marginatis; corpore inferiore griseo-fusco; jugulo latis strigis albis plumisque longioribus ornato; caudd viridi-fuscd, rectricibus lateralibus viz albo ad apices pictis, centralibus attenuatis, valdè elongatis.*

All the upper surface bronzy brown; ear-coverts dark brown, bordered above and below with a line of buff; under surface brownish grey, with broad stripes of white down the throat, where the feathers are much elongated; tail greenish brown, the lateral feathers slightly tipped with white; the central feathers much elongated and attenuated towards the apex, the attenuated portion white; wings brown;

upper tail-coverts very broad, much-prolonged and hair-like; bill black, basal half of the under mandible straw-colour.

Total length, $6\frac{1}{2}$ inches; bill, $1\frac{1}{2}$; wing, $2\frac{3}{8}$; tail, 3.

Hab. Peru?

Remark.—This bird belongs to the same section as the *T. Bourcieri*, *T. Guy*, *T. Eurynome*, &c. of Less., and equals in size the largest of them.

The species described by me at the meeting of June 9, 1846, (present vol. pp. 129, 130) were

18. *TROCHILUS* (*PETASOPHORA*) *CORUSCANS*, a beautiful species allied to the *Anais*, but whose locality is unknown to me.

19. *TROCHILUS* (—?) *FLABELLIFERA*, which is nearly allied to, but a much larger species than *T. mellivora*, said to inhabit Mexico; and

20. *TROCHILUS* (—?) *STROPHIANUS*, a fine new species of the same form as the *Clarisse* and the *Parzudaki*.

BOTANICAL SOCIETY OF EDINBURGH.

June 11, 1846.—Professor Balfour, President, in the Chair.

The following communications were read:—

1. "On the presence of Fluorine in Plants," by Dr. George Wilson.

2. "Notice of the discovery of *Luzula nivea*, in a wood at Broomhall, near Dunfermline," by Dr. Dewar.

3. "On the distinctions between *Parietaria erecta* and *P. diffusa* of Mertens and Koch," by Charles C. Babington, M.A., F.L.S.

4. "Observations on some rare Plants gathered in the neighbourhood of Edinburgh," by Dr. Balfour and Mr. Evans. Fresh specimens of some of the rarest of these were exhibited to the meeting, among which may be mentioned, *Oxytropis uralensis*, *Vicia lutea*, *Orobanche rubra*, *Carduus setosus*, *Luzula nivea*, *Lepidium rudemale*, and *Malcolmia maritima*.

July 9.—Professor Balfour, President, in the Chair.

The following communications were read:—

1. "Observations on the Plant yielding the drug Mudar of India," by Dr. Douglas MacLagan.

2. "Remarks on the elongation of the peduncle of *Vallisneria spiralis*," by H. Denny, Esq., Leeds. In this communication Mr. D. alluded particularly to the rapidity of its growth, and to its non-spiral nature, in the specimens of the pistilliferous plant grown by him; he also noticed the rapid evolution of gas from the plants when placed in the sun.

3. "Remarks on the Greenheart, or Beeberu-Bark Tree of Demerara," by Dr. G. R. Bonyun. Dr. B. stated, that the description of the parts of the flower as given by Schomburgk, is not quite correct, and thinks that the plant cannot be referred to the genus *Nectandra*. According to Dr. Bonyun, it has an 8, 10, or 12-partite perigone, outer segments persistent, stamens varying from twelve to

twenty, all fertile, with two minute scales at the base of each. A drawing of the plant accompanied the communication.

Dr. Balfour noticed the discovery, by Mr. Crighton, of *Campanula rapunculoides*, near Luffness.

Mr. James M'Nab exhibited a beautiful collection of British Orchids, containing specimens of all the species known as natives, with one exception.

Some new and rare plants from the hothouses of the Botanic Garden were exhibited to the meeting, among which *Thomasia tomentosa* from Swan River, *Posoqueria longiflora*, *Abutilon Russelianum*, *Pistia stratiotes* in flower, and a new species of *Turraea*, were particularly interesting.

November 12.—Professor Balfour, President, in the Chair.

The following communications were read :—

1. "On three species of *Glyceria*," by Mr. Fred. Townsend. The author gave full descriptions of *Glyceria fluitans*, Br., *G. plicata*, Fries, and of a supposed new species found in Cambridgeshire and Warwickshire, which he proposes to name *G. hybrida*, and pointed out the distinctions by which they may be known from each other.

2. Dr. Balfour read a description of *Exogonium Purga*, Benth., the true Jalap plant, and noticed some points connected with its medical history. The jalap plant was for a long time referred to *Convolvulus Jalapa* of Linnæus and Willdenow, or *Ipomæa macrorrhiza* of Michaux, a native of Vera Cruz. It has recently been proved, however, from various sources, to be the plant now under notice, which grows in the hill country near Jalapa in Mexico, at a height of about 6000 feet above the level of the sea. The plant was first sent to the Edinburgh Botanic Garden by Dr. Christison, who received it from Dr. Coxe of Philadelphia, and it has flowered several times in a cold frame. It belongs to the Nat. Ord. Convolvulaceæ. Specimens of the recent plant were exhibited. He also exhibited a fresh specimen in flower of *Stenocarpus Cunninghami* of Hooker. This plant has been long known in gardens under the name of *Agnostus sinuatus*. It is a small evergreen tree belonging to the Nat. Order Proteaceæ. It was found by Allan Cunningham on the banks of the Brisbane River, Moreton Bay, and has flowered this season for the first time in Britain.

3. "Remarks on a *Pyrola* found in Lancashire," by Mr. Kenyon. Specimens of this plant, which is considered by its discoverer as a new species, and which he proposes to call *P. maritima*, in allusion to the localities in which it is generally found, were shown to the meeting. It is nearly allied to *P. rotundifolia*, from which it may be distinguished by its size, the form and length of its sepals, and length of the stamens. Some excellent botanists who have examined it, are of opinion that it is only a variety of that species.

Mr. Wm. M'Ivor of the Kew Gardens sent specimens of an *Orobanche*, considered by him to be *O. lucorum*, Braun, gathered on Epsom Downs; also *Thorea ramosissima*, from Studley, Yorkshire; and *Hormospora mutabilis*, from the Thames, near Walton.

MISCELLANEOUS.

HABITS OF THE "KAKAPO" AND "MACRO" OF NEW ZEALAND.

IN a note dated 2nd May 1846, which I have just received from Governor Grey, he makes the following observations on the Kakapo, *Strigops habroptilus* of my brother's 'Genera of Birds':—

"I have been some time past engaged in instituting inquiries into its natural history, and intended to have been the first to forward it to Europe, at the same time transmitting you a full account of it. I now send you a head of this bird; its real name is not what you state, but *Kakapo*, the word '*kaka*' meaning Parrot, and '*po*' night, the compound signifying '*night Parrot*'; you thus see that you have rightly divined its nocturnal habits. This bird, since rats and cats have been introduced into the island, is rapidly becoming extinct, indeed so much so, that it is in some parts regarded as a fabulous bird, and many Europeans regard it as such. The same natives who first made me fully acquainted with the existence of this bird and its habits, described to me another new animal which they call a '*Macro*'; they say it is like a man covered over with hair, but smaller and with long claws; it inhabits trees and lives on birds; they represent it as being strong and active, and state they are afraid of them. I hope in a few weeks to be able to visit the country (mountains covered with forests) which the animals live in, and as I am not afraid of them, I hope I shall send you one before long." The "*Macro*" is most probably a Lemurideous animal by the description; some, as the Indri, have a man-like appearance, and many eat birds.—J. E. GRAY.

On the Medicinal Properties of our Geraniums. By Dr. JOHNSTON.

A few weeks ago my friend Dr. Edgar brought a plant to me to have it named. It was a dried fragment of *Geranium pratense*. The Doctor told me that a person resident in or about Ford had acquired great local fame, for the cure of fluxes in general, and the only remedy used was an infusion of this Geranium. One dozen stalks are "masked" in a pint of boiling water, and of this two ounces are taken three times a-day. Dr. Edgar's interest had been raised by the cure of a patient of his own, who had been greatly reduced by a chronic diarrhoea that had resisted the ordinary medicinal treatment, but yielded speedily to the geranium infusion. He felt relief from the second dose, and continuing to take it for three or four days, he was permanently cured. It was said to be a good medicine in the diarrhoea of teething children, and is easily taken by them, for the taste is "like tea without sugar, rather sweeter."

It is very likely that this remedy is inferior, for general use, to more powerful vegetable and mineral astringents of modern introduction into practice, but I think it worth while to bring the subject before the Club, since it relates to a matter of local interest; and there are cases in which it is well for a medical man to have a wide

range of medicines to ring the changes upon. No *Geranium* has now a place in any British Pharmacopœia*, but several species hold a conspicuous place in the old Herbals. Of *Geranium pratense* and its immediate allies, Gerarde says, "none of these plants are now in vse in physicke; yet Fuschius sayeth that cranes-bill with the blew floure (*G. pratense*) is an excellent thing to heale wounds."—Our author speaks in very different terms of our commoner species, *Ger. molle* and *dissectum*. "The herbe and roots dried," says he, "beaten into most fine powder, and given halfe a spoonful fasting, and the like quantitie to bedwards in red wine, or old claret, for the space of one and twentie days together, cureth miraculously ruptures or burstings, as myselfe have often proved, whereby I haue gotten crownes and credit: if the ruptures be in aged persons, it shall be needfull to adde thereto the powder of red snailles (those without shels) dried in an ouen, in number nine, which fortifie the herbs in such sort, that it neuer faileth, although the rupture be great and of long continuance: it likewise profiteth much those that are wounded into the body, and the decoction of the herbe made in wine, prevaileth mightily in healing inward wounds, as myselfe haue likewise proved."—*Historie of Plants*, p. 939.

Ray also furnishes us with a proof of the medicinal virtue of the *Gerania*. When he tells us that *Geranium molle* and *robertianum* are added to vulnerary potions and fomentations to stay fluxes and effusions of blood, and to relieve the pains of colic, and of the stone and gravel, he merely gives us a summary of preceding observation; but he speaks from his own knowledge when he details the case of his host at Carlisle, who, subject to frequent severe paroxysms of pain from calculus, found in nothing so much relief as from a decoction of *Ger. robertianum*. (Syn. p. 361.) In a subsequent work, after repeating its virtues as a vulnerary herb, Ray mentions that a decoction of the same species is used by shepherds to cure their cattle passing bloody urine. (*Hist. Plant.* ii. p. 1059.)

Geiger informs us that *G. pratense* and *sanguineum* were formerly officinal, the root and herb being used, both having an unpleasant odour and a very astringent taste, which is contrary to Dr. Edgar's information. Other compilers repeat the same tale† of the astringency of the *Gerania* in general, and of their popular use in fluxes and diseases of relaxation; but it is foreign to my purpose to enter farther on the subject than what is sufficient to show that the virtue ascribed to our district species is not imaginary.—*From the Transactions of the Berwickshire Naturalists' Club*, vol. ii. p. 175.

ON THE GENUS PEDICULARIA OR THYREUS.

Mr. Swainson, in 'Lardner's Ency.,' pp. 240, 245, 357, fig. 44, applied the former name to a small rosy shell found on coral at Sicily, which he arranges with the *Patellæ*, and it has been retained in that

* Several *Gerania* are introduced into Dr. Stokes's 'Botanical Materia Medica,' but without any indication of their properties.

† For extracts from the works of L. Mérat, Geiger and Gerbuiet, I am indebted to the obliging kindness of Professor Christison.

family by all succeeding authors. Philippi also described and figured it as new under the name of *Thyreus Paradoxus*, Supp. 92. t. 18. f. 11.

Having lately obtained a fresh specimen with the animal dried in it, I soaked it in water, and on comparing the remains of the animal with other genera, I believe that the *Pedicularia* of Swainson should be placed next to *Concholepas*, if it is more than a section of that genus, for it only differs from that genus in having no tooth-like process on the front of the outer lip, and in the edge of the outer lip being generally sinuous, and the inner or columellar lip being rounded, callous, and covering part of the left side of the last whorl. There is a small white shell in Mr. Cuming's collection from the Philippines which has similar characters, but it is even more like the typical *Concholepas* than *Pedicularia Sicula* of Swainson.—J. E. GRAY.

Descriptions of some new species of Indian Lizards.

By J. E. GRAY, Esq.

Mr. Jerdon of Madras having kindly sent to the Museum a series of specimens of Indian reptiles, I hasten to describe the following species, which have not before occurred to me, and consequently are not described in my recent Synoptic Catalogue of Reptiles in the British Museum.

Fam. GECKOTIDÆ.

Goniodactylus indicus.—Brown, darker marbled and spotted; scales of body and tail small, equal, six-sided; of underside of tail rather larger, six-sided; lower lip-shield 5·1·5, square, front larger, equal, rest gradually smaller, last very small.

Hab. Madras. Brit. Mus.

These were accompanied by four species of *Hemidactylus*.

Fam. AGAMIDÆ.

Calotes viridis. Nape with two isolated spines above the ears. Neck without any pit in front of the shoulder, but with dark spots at the hinder part of the lower jaw; eyebrows not horned. Green; scales large, of base of tail larger, of limbs and underside of the body smaller, of crown smaller. Nape and shoulders with a compressed crest; hinder part of back and tail with an obscure keel.

Hab. Madras. Brit. Mus.

Like *C. versicolor*, but uniformly coloured, the back less crested, and the scales smaller.

Salea Jerdonii. The nuchal and dorsal crest formed of elongated compressed scales; tail with a keeled crest. Blackish, white spotted, spot forming distant cross-bands; lips and beneath white.

Hab. Madras. Brit. Mus.

This genus is best distinguished from *Calotes* by the length and acuteness of the keeled scales of the back, side and under part of body, and their being all placed in longitudinal series. The other species has only the nape shortly crested.

Draconella Dussumieri, Gray, *Syn. Rept. Brit. Mus.* 234; *Sitana Ponticeriana*, Cuv., Gray, *l. c.* 236; and *Charasia dorsalis*, Gray, *l. c.* 246, were also contained in the collection.

Fam. SCINCIDÆ.

Mocóa bilineata. Fronto-parietal plates two, separate; ears round, moderate, with two very indistinct minute scales in front; the drum sunken; scales six or eight-rowed, very thin, smooth. Olive, with two black streaks, sides above blackish, beneath pale; cheek dark white, spotted; chin and beneath white. Young paler.

Hab. Madras. Brit. Mus.

Most allied to *Mocóa africana*, Cat. Rept. Brit. Mus. 83, from West Africa.

Riopa albopunctata. Pale olive-brown, yellowish beneath; sides of the head and of the front half of the body blackish, minutely white dotted.

Hab. Madras. Brit. Mus.

Tiliqua pulchra, Gray, *Illust. Ind. Zool.* t. f. 2, from General Hardwicke's drawing may be intended for this species, but it looks too fusiform.

Riopa Hardwickii, Gray, *Syn. Rept. Brit. Mus.* 96.

Hab. Madras. Brit. Mus.

Tiliqua rubriventris, Gray, *Illust. Ind. Zool.* 9. tab. f. 1. Olive, with a few scattered black spots; beneath yellowish white; temples, sides and limbs with white-eyed black spots; scales three-keeled.

Hab. Madras. Before only known from General Hardwicke's drawing, which did not represent the scales as keeled.

Euprepis trilineata. Fronto- and interparietals separate, scales five-keeled. Pale olive, with white-eyed brown spots; head and front half of the body with three dark-edged pale streaks; lips and beneath yellow; ears with two elongated scales in front.

Hab. Madras. Brit. Mus.

This species is distinct from *Tiliqua trivittata*, Gray, *Illust. Ind. Zool.* tab. , figured from General Hardwicke's drawings, but still unknown in Europe.

Description of Unio abacoides, a new species. By S. S. HALDEMAN.

Shell subovate, obtusely and regularly rounded posteriorly; discs approximate, chestnut-brown and pale green, with green radiating interrupted capillary lines, and a tendency to form a submedial nodulous ridge: primary teeth robust, their inner margin nearly at right angles with the short lamellar teeth: pallial and muscular impressions well-marked: nacre white, roseate posteriorly.

Length $2\frac{3}{8}$ inches; height 2; diameter $1\frac{1}{2}$.

Allied to *U. dromas*, Lea, and *U. intermedius*, Conrad, but proportionally longer than either. In its outline and small transverse diameter it resembles *U. abacus*. I am indebted for this interesting shell to the liberality of Dr. Foreman, who received it from Eastern Tennessee.—*Silliman's American Journal*, Sept. 1846.

NEW SPECIES OF VOLUTE.

Voluta Sophia. Shell ovate, ventricose, white with minute red dots, and a few series of irregular red spots; last whorl ventricose, with a series of large conical tubercles behind; spire very short; the apex rather produced, rounded, crenulated.

Hab. North Australia, Endeavour Sound.

This species is most like *Voluta cymbiola*, but much more ventricose and shorter. The spire of the older specimen is covered with a callous secretion.—J. E. GRAY.

METEOROLOGICAL OBSERVATIONS FOR OCT. 1846.

Chiswick.—October 1. Foggy: fine: overcast. 2. Hazy: very fine: rain. 3. 4. Very fine. 5. Cloudy. 6. Overcast: rain. 7. Fine: rain. 8. Clear: cloudy: rain. 9. Rain. 10. Boisterous: rain. 11. Fine: rain. 12. Foggy. 13. Slight rain: cloudy: clear. 14. Densely overcast: heavy rain. 15. Rain: cloudy: clear. 16. Clear: fine: rain at night. 17. Slight fog. 18. Heavy and continued rain. 19. Foggy: cloudy and fine: clear. 20. Hazy: very fine: clear. 21. Heavy rain: boisterous. 22. Cloudy: boisterous. 23. Fine: clear: slight frost at night. 24. Rain: fine: rain. 25. Cloudy. 26. Foggy. 27. Hazy: fine: foggy at night. 28. Dense fog. 29. Cloudy: slight rain. 30. Hazy: overcast: clear. 31. Foggy.

Mean temperature of the month 50°·37

Mean temperature of Oct. 1845 49°·96

Average mean temperature of Oct. for the last twenty years. 50°·43

Average amount of rain in Oct. 2·58 inches.

Boston.—Oct. 1. Fine. 2. Cloudy and foggy: rain A.M. and P.M. 3. Cloudy. 4. Fine. 5. Cloudy: rain P.M. 6. Fine. 7, 8. Cloudy: rain early A.M. 9. Rain: rain early A.M.: rain A.M. 10. Stormy. 11. Fine: rain P.M. 12. Cloudy: rain P.M. 13. Windy. 14. Rain: rain A.M. and P.M. 15. Fine. 16. Fine: rain early A.M. 17. Cloudy: rain early A.M. 18. Cloudy: rain A.M. and P.M. 19. Fine. 20. Rain: rain early A.M. 21. Rain and stormy: rain early A.M.: rain A.M. 22. Cloudy: rain P.M. 23. Cloudy. 24. Rain: rain early A.M. 25. Fine. 26—28. Foggy. 29. Cloudy. 30, 31. Foggy.—The past month has been an extraordinary moist one.

Sandwich Manse, Orkney.—Oct. 1, 2. Cloudy: clear. 3. Bright: clear. 4. 5. Bright: hazy. 6. Cloudy: rain. 7. Clear: hazy: aurora. 8. Bright: clear. 9. Bright: rain. 10. Rain: cloudy. 11. Bright: rain. 12. Cloudy: showers. 13. Cloudy. 14. Rain. 15. Rain: showers: aurora. 16. Bright: clear: aurora. 17. Fine: damp. 18. Bright: cloudy. 19. Rain: cloudy: aurora. 20. Bright: cloudy. 21. Cloudy: rain. 22. Bright: showers: aurora. 23. Showers: cloudy. 24. Cloudy: showers: aurora. 25. Bright: clear: aurora. 26. Frost: cloudy. 27. Frost: bright: clear: aurora. 28. Cloudy. 29, 30. Rain: drops. 31. Showers: cloudy.

Applegarth Manse, Dumfries-shire.—Oct. 1. Rain A.M.: cleared: fine. 2, 3. Fair and fine. 4. Fair, but raw: threatening. 5. Showers. 6. Violent showers P.M. 7. Violent showers P.M.: thunder. 8. Violent showers P.M. 9. Rain all day. 10. Showers. 11. Rain P.M. 12. Showers. 13. Fine and fair. 14. Heavy rain. 15. Fair and fine. 16. Rain P.M.: thunder. 17. Slight showers. 18. Slight showers P.M. 19. Frequent showers. 20. Showers A.M.: cleared. 21. Showers A.M. 22, 23. Fair. 24. Heavy rain. 25. Fair and clear. 26. Frost: clear. 27. Frost: cloudy. 28. Fair and fine. 29. Slight showers. 30. Rain A.M.: cleared. 31. Slight shower P.M.

Mean temperature of the month 49°·5

Mean temperature of Oct. 1845 49°·6

Mean temperature of Oct. for twenty-three years 46°·4

Mean rain in Oct. for eighteen years 3½ inches.

Meteorological Observations made by Mr. Thompson at the Garden of the Horticultural Society at Chiswick, near London; by Mr. Veall, at Boston; by the Rev. W. Dunbar, at Applegarth Aftane, Dumfriesshire; and by the Rev. C. Clouston, at Sandwick Manse, Orkney.

Days of Month.	Barometer.				Thermometer.				Wind.				Rain.			
	Chilswick.		Boston.	84 a.m.	Dumfries-shire.		Orkney Sandwick.	Chilwick.	Boston.	Dumfries-shire.	Orkney Sandwick.	Chilwick.	Boston.	Dumfries-shire.	Orkney Sandwick.	
	Max.	Min.			Max.	Min.										
1846.																
Oct.																
1.	29.937	29.886	29.43	29.70	29.78	29.72	29.72	53	58	63½	51	53	w.	sw.	sw.	
2.	29.785	29.610	29.30	29.70	29.47	29.42	29.42	57	55	60½	39	52	w.	sw.	sw.	
3.	29.700	29.532	29.18	29.57	29.62	29.58	29.58	54	59	64	41	55	w.	sw.	sw.	
4.	29.707	29.532	29.28	29.57	29.45	29.63	29.60	54	54	59	44	52	w.	sw.	sw.	
5.	29.432	29.393	28.95	28.97	29.22	29.42	29.42	65	52	59	59½	57	w.	sw.	sw.	
6.	29.544	29.430	28.81	28.90	29.13	29.14	29.10	59	51	59	54	58	w.	sw.	sw.	
7.	29.455	29.368	28.87	29.08	28.88	29.08	29.08	56	55½	61	48	53	w.	sw.	sw.	
8.	29.667	29.452	28.87	29.04	29.22	28.98	29.04	55	54	61	47	52½	w.	sw.	sw.	
9.	29.652	29.496	29.17	29.28	29.02	29.33	29.14	52	52	62	48	52½	w.	sw.	sw.	
10.	29.788	29.447	28.95	28.85	29.40	29.14	29.41	63	46	63	40	51½	w.	sw.	sw.	
11.	29.753	29.592	29.20	29.52	29.39	29.72	29.76	53	58	65	55	48	sw.	sw.	sw.	
12.	29.531	29.405	28.96	29.40	29.55	29.90	30.10	50	57	59	45	46	sw.	sw.	sw.	
13.	29.882	29.803	29.31	29.92	29.78	30.13	29.85	54	50	56	40	42½	sw.	sw.	sw.	
14.	29.501	28.992	29.00	29.05	28.75	29.00	29.00	45	45	56	45	41	sw.	sw.	sw.	
15.	29.084	28.924	28.56	28.74	28.92	28.98	28.98	49	55	56	45	48	sw.	sw.	sw.	
16.	29.268	29.189	28.80	29.08	29.20	29.31	29.42	55	54½	64	43	51	sw.	sw.	sw.	
17.	29.470	29.441	28.87	29.32	29.39	29.66	29.59	56	57	60	42	51	sw.	sw.	sw.	
18.	29.685	29.449	29.11	29.48	29.41	29.66	29.66	52	56	56	44	54½	sw.	sw.	sw.	
19.	29.750	29.668	29.24	29.40	29.35	29.43	29.43	52	58	52	50	52	sw.	sw.	sw.	
20.	29.559	29.536	29.06	29.30	29.25	29.38	29.33	45	51	54	56	52½	sw.	sw.	sw.	
21.	29.071	28.950	28.65	28.78	28.70	29.13	29.10	57	44	50	53	44	sw.	sw.	sw.	
22.	29.338	29.080	28.52	28.82	29.10	29.13	29.10	50	52½	56	42	50	sw.	sw.	sw.	
23.	29.821	29.614	29.15	29.44	29.47	29.42	29.53	56	59	48	50	48½	sw.	sw.	sw.	
24.	29.523	29.479	29.16	29.28	29.45	29.63	29.59	56	50	41	44½	43	sw.	sw.	sw.	
25.	29.864	29.687	29.34	29.80	29.89	30.06	30.00	53	41	45	53	40½	sw.	sw.	sw.	
26.	30.149	29.968	29.61	30.10	29.87	30.09	30.12	47	39	40	49	31	sw.	sw.	sw.	
27.	30.260	30.136	29.85	30.32	30.10	30.18	30.06	48	32	37	50	33	sw.	sw.	sw.	
28.	30.211	30.109	29.88	30.00	29.92	29.95	29.98	52	39	38	52	45	sw.	sw.	sw.	
29.	30.028	29.974	29.72	30.02	30.07	30.12	30.12	50	45	40	52	44	sw.	sw.	sw.	
30.	30.130	30.102	29.72	30.03	30.00	29.85	29.85	54	33	47	50	39	sw.	sw.	sw.	
31.	30.131	30.071	29.78	29.88	29.80	29.66	29.66	39	36	56	41	53	sw.	sw.	sw.	
Mean.	29.698	29.556	29.17	29.123	29.441	29.552	29.557	57.97	42.77	50.1	55.1	44.3	50.37	49.35	55.4	
															4.39	
															4.19	
															3.55	

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XLVI.—*On the Organization of the Polygastric Infusoria.*
By C. ECKHARD*.

[With two Plates.]

1. SINCE the discovery and the progressive perfection of the microscope, a new impulse has been given to all those branches of scientific study in which its use is applicable, from which we cannot withhold our acknowledgement, because it has enriched us with a number of the most interesting facts, which formerly could not have been anticipated. In botany, R. Brown, H. Mohl, M. J. Schleiden and others have investigated with success; and in the zoological and anatomical department the not less important researches of J. Müller, Bischoff, Schwann, Reichert, &c. have appeared. Ehrenberg undoubtedly gave a most important impulse to all these microscopic inquiries by his numerous investigations in one class of animals, which before him had been examined by few only, and the anatomical and physiological relations of which at that time were almost unknown. Unfortunately however, this store of excellent observations has not been estimated according to its true value; to many it has been inaccessible, whilst others have either not repeated the observations, or only imperfectly, and have hence expressed views which have not stood the test of a critical examination. In the '*Lehrbuch der vergleichenden Anatomie*,' by Von Siebold and Stannius, which appeared last year, in the section on the Infusoria, Siebold has adopted views of their structure which totally differ from those of Ehrenberg. Consequently these required thorough elucidation, to separate mere opinions from what may be considered as well-determined scientific facts; especially since doubt has been thrown upon even Ehrenberg's views, although founded upon distinct observation. Schmidt has fully discussed Siebold's views on the structure of the Rotatoria in a previous part of this journal: I shall attempt to do so as regards the Polygastrica in this paper. My reasons for fully entering into the organization and physiology of these animals, are, on the one hand, that we are at present in possession of no treatise which lays before us the details of this subject in connexion (for Ehrenberg's observations are widely

* Translated by Dr. J. W. Griffith from Wiegmann's Archiv, Part 3, 1846.
Ann. & Mag. N. Hist. Vol. xviii. *Suppl.* 2 I

scattered, and are only to be found in the large works on Infusoria), and, on the other hand, that I have made some new observations, which may probably possess interest.

2. Before passing on to the true demonstration of the relations of their organization, I must examine more minutely an expression of Siebold in the work above quoted. It is as follows (p. 7) : " But those infusoria which remain as Polygastrica (after the separation of the Rotatoria) require a further limitation, because those organisms which are enumerated among the *Closterina*, *Bacillarina*, *Volvocina*, and probably many other of Ehrenberg's animals, having stomachs but not intestines, must be referred to the vegetable kingdom." The dispute regarding the nature of these bodies is old, and dates from the time of their discovery. It has been renewed innumerable times, by both zoologists and botanists; nevertheless the truth is apparently not yet determined. Both manuals of botany and zoology frequently contain one and the same genus, or in fact, family. I fear that again to bring forward the question will be irksome to those who have long since satisfactorily proved the animal nature of the supposed plants, but I cannot refrain from so doing. It therefore first becomes requisite to attempt to restore to their proper place the three families referred by Siebold to the vegetable kingdom.

I. *Closterina*.—The grounds for their being of animal nature are derived partly from their motion, partly from their organization. On the leaves of *Ceratophyllum*, I observed the manner in which several *Closteria* adhered elegantly by one extremity; in about a quarter or half an hour many of them were situated in the same manner upon a higher part of the leaf: not a single animalcule was found on the side of the leaf, nor adherent longitudinally to it. They had evidently moved during the above time from the lower to the upper part of the leaf. If we observe their motions under the microscope, they are not so rapid as those of many other polygastric infusoria, but the motion is always evidently animal. They swim, especially in summer, in the most varied directions, and I have frequently seen *Cl. acerosum* and *Lunula* swim against the current when the water on the object-holder was flowing towards one side, whilst fragments of plants, various kinds of *Spirogyra* and *Oscillatoria*, were carried away. It is difficult here to discover anything but animal motion; to explain this however by electricity, as Turpin attempted*, is unnatural, and not less absurd than that of the muscular fibre by the same natural agent by Strauss. But the relations of the organization of the *Closterina* are likewise in favour of their animal nature. In illustration of this I shall confine myself to

* Sur les Closteries.

Cl. acerosum, which is figured in Plate IX. B. fig. 1. We see that the animal, which is expanded in the middle, is elongated symmetrically on each side. In the middle there is a transverse fissure *m*, which probably serves for the admission of nourishment; since, when this animal is kept for some time in coloured water, we perceive little accumulations of the colouring matters. At the extremities we see on each side a vesicle *b*, in which minute granules (?) incessantly move. In other species there is moreover a small aperture *r*; it is situated more posteriorly, and is perhaps connected with the cell. Ehrenberg twice saw in this animalcule filaments (feet?) project from it. Internally there are, on each side, two to four cords, *s' s'' s'''*, and a row (in other kinds several) of glandular bodies *d*. In the species figured, I have so often seen the above change in relative position, that I have been compelled to wait until they again appeared in their original position in order to delineate them. All this is not plant-like; and if the carapace of the *Closterina* should prove to be of a horny nature, as would appear to be the case from their becoming wrinkled when heated, they would be removed from the vegetable kingdom with still greater certainty.

II. *Bacillarina*.—The greatest doubt has certainly been raised regarding the animal nature of the forms which belong to this family. I think however that if we collect all the observations which have hitherto been made upon these bodies, they must be referred to the animal kingdom. We will therefore consider the following:—

I have, a hundred times, seen *Navicula Acus* and *Librile* swim against the current as distinctly as the *Closteria*, so that these motions cannot be regarded otherwise than as dependent upon the will of the animals. In addition to this, the shells of all the *Bacillarina* are formed in a much more complicated manner (3) than the other inorganic parts which we commonly find in plants. We find calcareous incrustations, crystals, &c., but never such symmetrically formed shells as in the *Bacillarina*. Plants have no such power over inorganic chemical agency as to elaborate inorganic matters according to their will independently of the laws of such matters, and such as we must presuppose to exist in the formation of the carapace of the *Bacillarina*. The exertion of feet at the anterior, and probably also at the inferior apertures of the carapace, speaks decidedly in favour of the animal nature of the *Naviculæ*. Ehrenberg first detected it, and described it in the 'Transactions of the Berlin Academy *.' After him it was observed by Schmidt, and in the latter part of the autumn of last year I succeeded in seeing it. Its not being more frequently detected, depends upon

* For the year 1836, p. 134, and 1839, p. 102; and Taylor's Scientific Memoirs, Parts X. and XI.

the fact that such phænomena cannot be produced, but depend upon fortunate circumstances, which we must take the chance of meeting with. Lastly, should the observation of Werneck*, who saw a *Peridinium* inside a *Navicula* and thought that it had been eaten by it, be true, as can scarcely be doubted from so acute an observer, the dispute regarding the nature of the *Bacillarina* would be at an end.

III. *Volvocina*.—How Siebold has been able to refer these to the vegetable kingdom is to me incomprehensible; the distinct ascent and descent of *Volvox globator*, when kept in glasses, the spontaneous motion of the two proboscides of each separate animalcule, and the contractile vesicle discovered by Ehrenberg, leave no further doubt on this matter.

It still remains for us to bring forward and examine the grounds upon which Siebold based his opinion on the nature of the three families we have mentioned. At pages 8 and 9 we find the following remarks, which, if they cannot together be adduced as a direct ground for the author's view, nevertheless may serve as matter for further consideration:—

1) "It is quite different with the locomotions of the lowest vegetable organisms (among which, as we know, the families above-mentioned are enumerated), since these are not the consequence of an internal voluntary influence, and do not arise from any spontaneously contractile and expansible parenchyma," &c. It appears to me to follow with certainty from the observations detailed in I. to III., that the motions are truly dependent upon an internal voluntary influence of these animals. But as regards the supposition that they do not arise from any spontaneously contractile and expansible parenchyma, this is not proved. As the body of the *Bacillarina*, which is almost as transparent as water, is inclosed by a siliceous carapace, it is hardly possible, with our present optical resources and the ordinary methods of optical investigation, to observe the contraction of the body. Besides, the organs regarded by Ehrenberg as ovaries often exhibit such different arrangements, that we are easily led to imagine the existence of an expansibility and contractility of the parenchyma of the body.

2) "Ciliated organs occur in the vegetable kingdom in the form of ciliated epithelium in the spores of *Vaucheria*, and in the form of isolated, long whip-shaped threads in the spores and early stages of different *Confervæ*, among which we find several of the organisms described by Ehrenberg as *Monadina* and *Volvocina*." Siebold was evidently led to this assertion by a contribution of Thuret to the '*Annales des Sciences Naturelles*,' which work

* Monthly Report of the Berlin Academy, 1841, p. 109.

he quotes. Even if ciliated organs do really occur in the spores of Algæ, these cannot be regarded as true *locomotive organs*. Their peculiar motions, with which natural philosophers are at present so much occupied, also occur *without* locomotive organs, and take place in other substances, as small particles of dust. It appears to be proved by Ehrenberg's observations on the spores of *Saprolechnia* (*Conserva ferox*, Gruith; *Achlya*, N. ab Esenb.), which I can confirm, that chemical processes are the chief agents in it. This view finds support in the following discovery: I occupied myself for some time during the past summer with investigations on the process of germination in our Cerealia. The minute particles which occur in the cells of the grains among the large granules of starch, at first did not exhibit the least trace of motion; but as soon as germination began they moved actively, and when the first leaf sprouted out, the movements were so remarkable, that I could hardly distinguish them from those of the ripe spores of *Achlya prolifera*. Siebold's opinion, that in many of the organisms figured by Thuret we might recognise several which Ehrenberg has described as *Monadina* and *Volvocina*, is quite correct. But which of the two is in error? Is it Ehrenberg's fault, if Thuret figures Infusoria as spores of Algæ? I shall hereafter enter upon Thuret's memoir in a separate communication and point out the errors contained in it.

3) "Many of these lower vegetable formations (*Bacillariæ* and *Diatomeæ*) have been considered as animals from their locomotion, although the alterations in position observable in them do not give the slightest impression of their emanating from an internal will of the organism." It is at once obvious, that the actual impression which these minute creatures make upon the observer cannot afford grounds for deciding any question, for in matters of science we require objective grounds. I must also confess, that when I first observed these animals, they gave me the impression of *this* alone. Hence we have both observed one and the same thing and derived *different* impressions from it.

Covering of the Body.

3. The Polygastric Infusoria are either furnished with a carapace or not. When present, it either consists of silica, which in many cases contains a considerable per-centage of oxide of iron, or it is more of a horny nature (*Closterina*). The carapaces assume various forms; being sometimes oval and truncated at the extremities, sometimes very narrow and pointed at the extremities, sometimes broad and symmetrically excavated at the sides, and many other varieties of form. Among those not having a carapace, there are some which are inclosed in great number in mucoid masses, as the *Ophrydina*, which live together frequently by hun-

dreds in green globules not unlike frog's spawn. In the intestine of the frog we find forms, some of which (especially *Bursaria ranarum*) are inclosed in mucous envelopes, which reminds us of similar occurrences among the Entozoa.

Locomotive Organs.

4. They are present in various forms, and furnish us with a proof of the incorrectness of the view, that the lowest animal beings throughout exhibit a more simple, homogeneous, and consequently more imperfect organization than the higher ones. To survey them, we shall consider them in the three following groups:—

1) *Locomotive organs placed around the mouth.*—The organs which belong here, in whatever form they occur, are apparently always organs of prehension, taste, &c., and hence, strictly speaking, should be separated from the organs of motion. However, as they correspond to the hands and other like formations of the higher animals, they ought to be placed here. In the Rotatoria they are much more perfectly developed in the so-called rotatory organ, which appears in the most numerous and complicated forms. The Polygastrica exhibit more simple forms, but still sufficient difference to merit more accurate consideration. In their simplest state they appear as one or two filiform proboscides, frequently of such tenuity that they are only perceptible when seen in motion between minute coloured particles. They exist in greater number in *Vorticella*, *Epistylis*, *Enchelys*, &c. In these instances they form a circle around the mouth, which consists of either one or two rows of cilia, and then frequently exhibit surprising resemblance to several kinds of rotatory organs. These ciliary circles exhibit differences according to the different form of the mouth. In many they are susceptible of retraction; this is most constantly the case in *Epistylis grandis*.

2) *Locomotive organs which cover the whole body, or may be considered as lateral appendages.*—In most of the Polygastrica these are likewise cilia, the usual arrangement of which is in longitudinal striæ (probably muscular) corresponding to the axis of the body, to which the former are attached. They often appear in great numbers. In others the cilia are arranged in circles which surround the middle of the body obliquely, as may be seen very distinctly in the *Peridinae*. In *Spirostomum ambiguum* there is a row of cilia (6 A) running the whole length of the body. In the *Stylonychiæ* they are remarkably different. Their somewhat elongated oral fissure is surrounded by cilia of the usual structure, those on the body being more rigid. But what is most remarkable in them is, that they are not placed on the muscular striæ which run longitudinally down the body, but

are more scattered, and are principally developed at the anterior and posterior extremities of the body. Each bristle (as these cilia are properly called) is *articulated at the base*, and is consequently susceptible of a distinct motion, whilst in the ordinary cilia their motions appear dependent upon the striæ on which they are situated (fig. 2).

3) *Locomotive organs belonging to the posterior part of the body.* Several forms exhibit in this spot cilia which are not remarkable, but merely resemble those described under 2; others have small fibres, with which they fix themselves (Stentors); others again exhibit parts in which the muscular system in its primitive form may be more perfectly studied than elsewhere: I allude here especially to the *Vorticellæ*. These animals are situated upon the extremities of simple or divided trunks, the structure of which, in those having the power of springing back, is as follows:—A sheath (muscular sheath), fig. 3 s, incloses a simple muscle, which disappears a little above the part at which the sheath is attached to foreign bodies. The evident connexion between the motions of the body with those of the muscular peduncle shows us that the muscle ramifies within the animal itself. I have only succeeded in observing this ramification in *Vorticella nebulifera*. I saw two very distinct, although very small (not perceptible without a power of 400 diameters) fibres, fig. 3 v v, stretching inside the body. Ehrenberg saw a similar extension of the muscle in the body of *V. Convallaria*. When this peduncle is not contracted, the whole body of the animal is in a state of full extension; but as soon as it contracts this, especially when it draws in the oral cilia, the sheath and the muscle both become shortened (the whole peduncle becoming spirally coiled) and the animalcule springs back on its peduncle; if the body becomes again extended, and especially if the oral cilia are very distinctly unfolded, the peduncle also passes from its contracted into the elongated state. The oral cilia and the whole of the anterior part of the body appear to be of importance in this retraction, since expansion and contraction of the trunk and body appear mutually conditional. What influence upon the motions we have just described must be attributed to the muscular sheath, and what to the muscle, has not yet been satisfactorily determined. This much however is certain, that for *perfect* retraction three conditions are requisite;—*an uninjured state* of the muscular sheath, *an uninjured condition* of the muscle, and *attachment* of the entire peduncle; for in *Vorticellæ*, in which the muscle was torn in the uninjured sheath, I observed, it is true, a contraction of the body, but it had no influence on the extension and contraction of the peduncle; in others, the sheath of which had disappeared, the

muscle still remaining attached to the body, every attempt at complete retraction failed. In neither case had the animal become re-attached*. Among the Rotatoria we have an animal analogous to the retracting *Vorticella* in *Conochilus volvox*, in which however, independently of the fact that the separate animals in it do not grow upon foreign bodies, but are united together by their peduncle, the muscle which passes through the muscular sheath divides into three or more bundles, which run separately in the body of the animal and are firmly attached to its internal surface.

The Vibrions indisputably exhibit the most active movements, but with our present optical resources it is impossible to discover either organs of motion or any muscular structure in them.

Alimentary Canal.

5. Most of Siebold's objections to Ehrenberg's views have been made against this part of the subject. In the following remarks I shall consider the individual parts of the alimentary canal in order, and test Siebold's opinions at the proper places.

1) *Mouth*.—A mouth has not been directly recognised in all Polygastric Infusoria; still in several of these dubious cases we may with certainty conclude as to its presence, either from alimentary matter being taken internally, or from one to two long cilia which we usually find around a mouth, or from some other circumstance. When distinctly present it forms sometimes a more or less roundish aperture (*Paramecium*, *Enchelys*, &c.), sometimes a longish fissure (*Stylonychia*), sometimes a spiral (*Spirostomum*), sometimes an aperture of some other form.

Dental structures, in comparison with those of the Rotatoria, in which they occur in such a variety of forms that a treatise might be written upon them alone, are very rare, and can scarcely be observed in any others than in *Chilodon*, *Nassula* and *Prorodon teres*. In these animals the circular oral aperture is internally covered with a ring of longish bristly teeth. According to Ehrenberg, these are forced out of the oral aperture in *P. teres* by drying the animal†. I have observed this Infusorium once only, and as I was not prepared for this phenomenon I overlooked it; but I distinctly saw in it the glands (six), which were not then known to him. The peculiar structure of the mouth

* As far as I know, the influence of the muscle and muscular sheath upon these motions has not been considered. It is therefore to be hoped that when favourable conditions present themselves, such as the injury of one of these parts, they may be taken advantage of in order to ascertain with certainty what share is taken by the muscular sheath and what by the muscle in the rapid contraction.

† *Schriften der Berliner Akademie*, 1833, p. 308, and *Infusorien*, p. 316.

in *Paramecium stomioptycha* * is worth notice. It is surrounded by three to four annular fibres *a*, which are of a tougher and more solid structure than the rest of the body; in it occurs a peculiar appendage *z* (rudiment of a tongue?).

We must now minutely examine another remark of Siebold. This philosopher divides the *Protozoa* (by which term he designates Ehrenberg's Polygastrica) into *Astoma* and *Stomatoda*, referring to the former the *Astasia*, *Peridinæa* and *Opalina*, and to the latter the remaining families of the Polygastrica. Independently of the question whether this division is natural, some parts must be corrected. As regards the *Astasia*, the mouth has certainly not been distinctly recognised, but may be imagined to exist in several. All the *Peridinæa* cannot possibly be referred to the *Astoma*, because *P. pulvisculus* † and *cinctum* ‡ are by no means destitute of mouth. Among the *Opalina*, Siebold has evidently taken *Op. ranarum*, Val., *Bursaria ranarum*, Ehrenb., as his type, as is shown elsewhere. Whether the author refers the remaining components of the genus *Bursaria* to the family of the *Opalina* or not, in no case can they be referred to the *Astoma*; for I have seen a distinct mouth in *Bursaria truncatella*, *flava*, and when young, *ranarum*. That the latter has not hitherto been found to take up particles of colouring matter or other nutriment internally does not appear very strange to me; for these animals live inside others, the fluids of which are so delicate that solid substances are not fit for their nutrition. Even if the oral fissure could not be pointed out, I should still hesitate to place so much value upon this distinction; for in taking such nutritive substances as the *Opalina* feed upon, a simple mere oral spot, a part of the body of more delicate structure than the other parts, especially adapted to the passage of animal juices as nutriment, would be sufficient. We have similar instances in the intestinal worms. Their proboscis has no mouth, still pouch-like organs proceed from the anterior part of it which cannot well be considered as anything else than alimentary canals.

2) *Intestinal Canal*.—The nutritive matters which have been taken by the mouth next arrive at a cavity which runs through the body in a direction varying in different genera (fig. 5 s). The gastric cells *z* are appended to this by means of hollow peduncles *i*. We might be easily led to consider the cavity *m*—*a* as an intestine; its function however does not admit of this supposition, as it merely serves for the transmission of the nutriment,

* Ehrenberg found this new species in the summer of 1845 on *Ectosperma clavata*, and had the kindness to give me some specimens of it for examination. (See contractile vesicle.)

† Ehrenberg, tab. 22. fig. 14.

‡ *Ib.* tab. 22. fig. 22.

which accumulates in the individual cells only, and is here applied to nutrition. Its physiological use therefore is merely as an œsophagus, the separate cells performing the functions of stomach and intestine. The substances return from the gastric cells into the common cavity, travelling from one cell to the other, and are finally evacuated by the anus. These intestinal phænomena cannot all be directly observed, so perfectly as we have just traced them, at one time and in a single individual, because they are of a delicate transparent structure and of the same refractive power as the parenchyma of the body; separate observations however compel us to adopt this view.

a. In such forms as are not too minute, we can distinctly observe how the nutriment or articles of food artificially supplied, constantly take a *definite* course in the body; in some instances the first portion of the alimentary canal can be observed when not in action, as in *Epistylis grandis*; it is then frequently seen to be covered on the inner surface with cilia, and which in the *Opercularia* may even be counted.

b. But that the alimentary canal, the commencement of which, as just stated, is distinctly perceptible, does not extend through a limited extent only of the body and then terminate, can also be proved in *Epistylis grandis*. If this animalcule takes colouring matters, we perceive that when these have passed through the course of the intestine, which can also be seen when the animal does not eat, a large piece frequently pursues its course for some distance and then only enters a cell.

c. In the same animal I once attentively observed what appeared to be the extremity of the intestinal canal, fig. 6 r, to ascertain what the further course of the coloured particles would be. At this time the animal had not filled any of the cells in its inside; suddenly both *i i* were so, although I had not perceived any nutriment pass by *r*. This clearly points out that the two cells must be in connexion with the common cavity from which they had become filled; and when, after the animal has fed for a considerable time, we see that similar filled cells are diffused throughout the body, this phænomenon affords a ground for the supposition that the intestinal cavity is of greater length than we should at first sight imagine.

3) *Anus*.—In by far the greater number of cases the absorbed substances are ejected by a distinct aperture. In a great many it has been directly observed, and in these is sometimes placed at that extremity opposite to the mouth, at others near to or at the side of it; whilst in others we can often conclude as to its presence by a distinctly defined spot.

I believe that the above observations are sufficient to prove the correctness of the view I have taken of the intestinal canal of

the Polygastric Infusoria. In what follows, some other phenomena will give support to it, and as I hope will remove any doubt still remaining.

We shall now revert to the consideration of Siebold's view of the means of nutrition in the Polygastrica. As he has separated the *Astoma* and *Stomatoda*, he is obliged to search for a method of explaining their nutrition. He has selected that which is most ready in such cases, viz. nutrition through the common integument of the body. In those forms in which a mouth or gastric cells filled with colouring matter have not been directly observed (such are extremely few, for the latter has been observed even in the *Navicula*, *Closterina* and *Monadina*), we will willingly adopt this obscure method of nutrition until further and more certain observations have been made. But as regards the genus *Opalina*, which Siebold has especially selected as his type in separating the organs of nutrition of the *Astoma*, we will examine his opinion on this point. He says (p. 15):—

“The *Opalinæ* do not exhibit an oral aperture upon any part of the surface of the body, never take particles of colouring matter into their interior, nor can foreign solid substances, perhaps swallowed as nutriment, ever be detected within them. But that these *Opalinæ* are capable of absorbing fluids by means of the surfaces of their body, we recognise in such individuals of *Opalina ranarum* as have existed in a rectum containing a large quantity of bile; they have then become coloured greenish throughout. If the *Opalinæ*, which require a certain amount only of moisture for their existence, are placed in contact with water, they absorb too much of this fluid, becoming greatly distended and gradually dying. In these *Opalinæ* the absorbed moisture accumulates in densely aggregated transparent vesicular drops beneath the cutaneous integument; cavities like these filled with a transparent fluid in the Infusoria have been designated by Ehrenberg as gastric vesicles (*ventriculi*), and by Dujardin as vacuoles.” I have already slightly alluded to this remark in considering the mouth, and shall merely add the following. The vesicular drops here spoken of by Siebold do not arise from the absorption of water, for they are also seen in those specimens which have been removed from the frog's intestine without the addition of water. They are certainly more visible in the latter, because the animals, which are somewhat folded up in the intestine, are then capable of expanding themselves. Moreover, it is incomprehensible how, in those individuals which have lived in an intestine filled with bile, this is diffused throughout the body, but not also in such vesicles as the water occurs in, or at least why the water which appears in vesicular drops should not be coloured by bile in these cases. The conditions of the nutrition of the *Stomatoda*, as detailed

above, have also been disputed by Siebold. His views of them, according to § 12, are essentially these:—The Polygastrica swallow nutritive matter (coloured particles) with the water. So long as this remains at the lower extremity of the œsophagus*, it appears as a pedunculated vesicle. It is loosened by the contraction of the œsophagus and then appears without a peduncle, and containing the bodies which have been swallowed, perfectly inclosed within it. The swallowed masses in the form of vesicles mutually press upon one another in the body when the animals have eaten too much, the earlier yielding before the subsequent ones. It sometimes happens that these drops when filled with solid food run into one another, which shows that they are not surrounded by a distinct (gastric) membrane. Against this ingenious supposition we have the following objections:—

a. No œsophagus has been proved to exist by observation, which continues for a certain distance within the body and then stops; the above phenomena rather indicate that an uninterrupted canal runs through the body from the mouth to the anus.

b. Hence the entire theory of the vesicles is untenable; this is confirmed by various observations and considerations.

In *Vorticella microstoma*† I often perceived how the nutritious matter about to be swallowed was formed into a minute ball in the anterior part of the oral aperture—I cannot better designate it than as a morsel. After this was effected, it was swallowed by the animal in such a manner that the separate particles remained united, as they had become in the oral aperture. The morsel then passed through the intestine for a considerable distance in the body, and appeared of the same form in a gastric cell. Certainly no drop inclosing the nutritive matter had formed at the lower extremity of the supposed œsophagus, for the formation of the morsel occurred in the oral aperture; but to admit that the morsel had become inclosed in a vesicle of water at the end of the œsophagus, or any such attempts at explaining this fact, would be opposed to physical laws. In other instances, and this may be observed with distinctness, especially in *Epietylis grandis*, when colouring matters are present in great quantity, the entire cavity is sometimes filled as far as a cell. On examining a mass of colouring matter, as *z*, fig. 6, without a drop of water in which it might be inclosed, and the continued filling of this cavity with solid particles, every appearance of the vesicle, as described by Siebold, vanishes. I have observed the running together of these aqueous vesicles inclosing solid matters but

* Siebold denies the existence of an alimentary canal, and supposes the presence of an œsophagus which only enters the body to a limited extent, and then terminates.

† Ehrenberg, tab. 25. fig. 3.

very rarely, and only when the animals were dying. Even if Siebold has seen it frequently and always in living specimens, which I however doubt, still he cannot conclude from this, that these spaces are not inclosed by any membranes; might they not be rent by the mutual pressure of the filled gastric cells on account of their delicate structure?

I shall conclude the considerations of the alimentary canal with an observation which appears to me especially adapted for disproving Siebold's views; it is this: Ehrenberg discovered that when carmine and indigo are mixed with water containing *Paramecium Aurelia*, in a short time some of the cells of the animalcule are occasionally filled with the red colouring matter only, others with blue. I have also seen this; it was first shown me by my teacher himself, and I have several times subsequently observed it. Siebold's mechanical explanation, in my opinion, is not sufficient to account for it; it constitutes a phenomenon which presupposes a tolerable development of the sense of taste.

Remark 1.—At p. 16 in note 1, Siebold says: "That organ which occurs in *Trachelius Ovum* and is regarded by Ehrenberg as a branched intestinal canal, has always appeared to me to be a fibrous, certainly not hollow cord, which runs through the extremely loose parenchyma, giving the interior of the animal a coarsely reticulated aspect by its ramifications." I have hitherto seen this animalcule twice only, as it is rare, and I cannot therefore form any definite opinion upon this organ. But I may assert with certainty that Siebold has either never seen it in a natural state, or has entirely mistaken its structure; for it requires a mere glance through the microscope to be convinced, that the question of its being a *fibrous* organ cannot be entertained for a moment.

Remark 2.—If Siebold denies the existence of an intestine in the Polygastric Infusoria, I am not aware how he can correctly denominate the excretory spot the *anus*, and why the excrements cannot exude from every part of the body.

Propagation.

6. The organs by which the preservation of the species is effected have always had a peculiar interest with physiologists, and have hence been treated of with a particular satisfaction. The delicacy of the parts and the mystery of the sexual process have a special charm with investigators, which is still more increased in the Infusoria by the minuteness of their forms. I shall therefore enter fully upon this point. If we first ask ourselves—how the Polygastrica are propagated?—it must be answered:

1) *Viviparously.*—Ehrenberg first observed this in *Monas vivipara*, in which the phenomenon is common. Moreover a some-

what similar occurrence is seen in *Stentor ceruleus*, to which I shall recur presently. Siebold appears to have overlooked this; for at p. 23, as the means of propagation of the Polygastrica, he only enumerates division and the formation of buds.

2) *By Zygosis*.—This has hitherto been observed in the animal kingdom only in the *Closterina*. In autumn we find young *Closteria* of such a form, that two globules, each of which is elongated on both sides into a point, have become adherent. Unfortunately their further stages of development have not yet been seen. We do not know whether perfect *Closteria* are formed by an intimate growing together of the globules with their elongations or by a progressive separation, although the former is probable. Should we be so fortunate as to clear up this point, and should the zygose prove to be a mode of propagation of the Polygastrica, it would not be so rare hereafter; for it has also been observed in species of *Spirogyra* and a mould-formation.

3) *By division*.—This occurs either transversely or longitudinally, or in one and the same species in both directions. It is evidently, in many families, one of the most productive methods of propagation, as in the *Bacillariæ*, *Kolpodea*, *Stylonychiæ*, &c. In the former the siliceous carapace divides regularly, and this might perhaps form another ground for enumerating them among animals.

4) *By formation of buds*.

5) *Formation of ova* has certainly not been directly observed, but the different sizes in which many Polygastrica, especially *Vorticellæ*, occur, perhaps allow us to conclude in favour of its existence. The difference in the size of *Vorticella microstoma* is most remarkable. In no instance could the individuals of this species, which are all so very small, be produced by division; nor by the formation of buds, for such has not yet been observed in them. I shall here mention an observation which I made in the early part of 1845 upon *Stentor ceruleus* to connect the further reflections on this point.

Plate X. fig. 7 exhibits this Infusorium. Within it I observed three or four globules in different states of development, which are represented in a row in figs. 8—14. In the first stage the contents of the globules, consisting of minute granules, exist most imperfectly developed; but few granules at present occur, and the globule, when it lies in the body, is not very distinct on account of the granular parenchyma of the latter. In the second stage of development, fig. 9, the granules appear more numerous, the contents are therefore more concentrated, and the globules can then be very distinctly observed in the body. Fig. 10 *a* shows the third stage; granules commence arranging themselves in a row *m*. They sometimes appear grouped in the same man-

ner at two spots, as shown in fig. 10 *b*. The granules thus arranged and closely pressed together blend into a glandular but clear organ, in which the granular structure cannot be any longer detected; frequently it is also divided into two parts, figs. 11 and 12. Lastly, in the situation of the transparent glandular organ a row of cilia appears, evidently the mouth (fig. 13 *a*); but whether the latter is formed immediately from the former I have not been able to ascertain with certainty, but it is extremely probable, since on the one hand the row of cilia occurs in the situation of the bright gland, whilst, on the other hand, in all the germs which exhibit this the former organ is absent. Simultaneously with the development of the mouth there appear one or two clear vesicles (figs. 13, 14 *b*). On the 18th of May I observed in the interior of *St. cæruleus* a germ as in fig. 13; I saw the cilia very distinctly in motion; the vesicles were however still absent, and they did not escape on this occasion. On the 21st I saw the perfect form, fig. 13, which issued out, whilst the parent animal swam away. I now attentively observed the young one to follow up its further changes, perhaps the bursting of the carapace; but I was obliged to leave off watching it in half an hour, as I could not vouch for the accuracy of further observation on account of the strain upon my eyes. On the 4th of June I saw a germ escape, as in fig. 14; it differed from that observed on the 21st of May, for, being at first round, it at once exhibited an incurvation at its lower extremity, an appearance frequently observed in young Stentors, sometimes in old ones, when they contract from the elongated form to one more or less rounded. I have subsequently once seen the escape of a similar germ, and it appears to me that the true point of maturity is that at which vesicles begin to be visible. In *Stentor polymorphus*, fig. 15, I have observed two such globules, but I have not succeeded in seeing any perfectly formed escape. In autumn I have often sought for the recurrence of this phenomenon, but have never been able to observe it so perfectly as in the spring, although similar globules are not rare in the later parts of the year.

How can we explain this phenomenon? It can hardly arise from *Vorticellæ* which have been swallowed, as has been proposed to me in conversation, since I observed such various conditions of development, which were moreover never observed except in one part of the body, never more anteriorly, which is hardly possible if they were substances which had been swallowed. I rather think it formed the earliest commencement of the formation of buds, which usually appears at this part of the body. But it is also possible that it is a peculiar kind of propagation, which Steenstrup* and others have observed in many intestinal

* On the Alternations of Generation.

worms, and which consists in this, that in the interior of the parent animals, germs (which had not hitherto been shown to be a consequence of sexual influences) are formed and separated. The fact which I have stated, that I have seen these globules escape, appears to support this view.

We have as yet been purposely silent on the true organs of generation, so as to be able now to devote ourselves to their consideration alone. Ehrenberg has mentioned as sexual organs one or two contractile vesicles and glands occurring either singly or in considerable number*. I shall consider both minutely, and see what signification they admit of.

A. *The contractile vesicle*.—If we examine a *Stylonychia* (Pl. IX. fig. 2) or a *Bursaria*, we observe, with a little effort, a bright, tolerably large vesicle. At first sight it appears to be a round aperture in the skin, whence it has happened that many observers have considered it as having some relation to the respiration; this however is by no means the case, for it lies within the body. We may easily convince ourselves of this fact by observing the animals (as Ehrenberg first stated) whilst revolving on their longitudinal axis. At those moments when the vesicle disappears, we see distinctly how the lines which cover the whole body longitudinally and are covered with cilia are drawn over the spot which is apparently open. It is often difficult to discover the vesicle on account of the number of granules which exist in the skin. The most common and very constant form is the globular; we scarcely ever notice any form which differs materially from this. But in some genera radii occur which traverse the body in a stellate manner, and are sometimes longer, at others shorter (fig. 4). The varieties in the number of the vesicles are likewise slight; there are usually one (in most genera) or two (*Paramecium*, *Chilodon Cucullulus*). Sometimes indeed several occur, but then usually the animal is in the act of division. In § 17 of Siebold's work there is something to correct. According to his account, *Trachelius Meleagris* is covered with a row of from eight to twelve round contractile cavities (p. 21); and Ehrenberg regards the colourless juice they contain, in consequence of an optical illusion, as gastric cells filled with a reddish gastric juice. But the fact is this: the eight to twelve round vesicles do not appear red as the result of an optical illusion, but in consequence of the coloured juice contained in them; for when the animals dissolve, the red juice is seen to pour out. This animal also exhibits two other vesicles, which are the true contractile bladders. Those occurring also in *Amphileptus Meleagris* and *longicollis* appear to me to correspond to the eight to ten vesicles in *Trachelius Meleagris*, as

* On a double condition of the sexes demonstrable as far down as the *Monadina*.

their contractions did not appear to me to be the same as I had been accustomed to see in other forms. Siebold ascribes to *Spirostomum ambiguum* a contractile reservoir in the form of a long pulsating vessel which runs through the longitudinally-extended abdomen. I have never seen this; perhaps Siebold has mistaken the two to four rows of cilia, which we have mentioned, for it. In *Stentor* also, in addition to the large round contractile spaces at the anterior extremity of the abdomen, there are several such spaces extending down the abdomen laterally. In my own examinations on the generative relations of the Stentors which I have already detailed, I have examined several hundred specimens, but, except the large contractile cavity, have never seen another situated laterally on the abdomen. Probably Siebold has examined the first stage of development (perhaps as fig. 8). The most important physiological property of this vesicle, as already pointed out, is its contractility. We see how, from time to time, it contracts powerfully, frequently spasmodically, again expands and repeats the contraction. In those cases in which the vesicle exhibits stellate extensions, these are expanded at the base so as to resemble a bulb, just as if some fluid contents had been impelled into them, which however has not been shown to be the case. The contractions in some occur regularly, in others irregularly. With a view to this point I observed, with Schmidt, *Paramecium Aurelia*, *Stylonychia pustulata* and *Bursaria flava*. We found that in *P. Aurelia*, from the commencement of one contraction to that of the following, six to eight, and in *Stylonychia* about ten to twelve seconds elapsed, but that in *Bursaria* the interval between the recurrence of the contractions was so short that it could not be estimated. Let us test by these observations the general correctness of Siebold's conclusion, "that there are hollow, rhythmically contractile, as it were, pulsating cavities in various forms, numbers and arrangement."

As regards the occurrence of contractile vesicles in the separate families, it has been proved in most of them. Even in the first treatise on this subject* attention was drawn to their presence in the greater number of forms, and instances have since been made known, in Ehrenberg's separate treatises, in which they were shown to exist, although formerly they appeared to be wanting. However, they have not been recognised hitherto in the following families (probably on account of the inadequacy of our optical means or other circumstances): *Vibrionea*, *Arcellina*, *Bacillarina*, *Closterina*, *Colepina* and *Dinobryina*.

B. *The glands*.—In addition to the vesicles, we find in almost all Polygastrica, glands of a somewhat more solid structure than

* Ehrenberg, *l. ult. cit.*

the rest of the body. They are best seen by allowing the Infusorium to decay from the deficiency of water without removing it from the glass-slide. In the work above quoted, Ehrenberg distinguished the following forms, among which all the varieties may be comprised:—

1. The globular; 2. the ovate; 3. the discoid; 4. the reniform; 5. the ligulate; 6. the moniliform; 7. the cylindrical; and 8. the annular. They appear to be more general than the vesicles, but have not been found in some, although few families. These are the *Colepina*, *Vibrionea*, *Dinobryina* and *Arcellina*. In regard to these organs also I find in Siebold (§ 21—23) some remarks to which I cannot assent.

a. The nucleus appears to him to be loose in the parenchyma, as the observation can be frequently made that the Infusoria revolved around the nucleus which remained at rest in their interior. This appearance however cannot so often be perceived, and only when we attentively observe the glands for a considerable time; it never appears when we first commence observation and observe both the glands and the body. I therefore consider this phenomenon as an optical illusion, especially when I recollect that it would be inexplicable how the glands in the different genera and species preserve so constant a position, which could not be expected in so yielding a parenchyma of the body as Siebold has presupposed in his consideration of the relations of nutrition to exist.

b. At p. 25, in note 2, Siebold supposes that the glands perhaps subsequently became developed into distinct animals, because after the death of the Infusoria they were not immediately destroyed. This also appears improbable to me, because I frequently saw these nuclei disappear even in half an hour or an hour, although water was present in sufficient quantity. That they are preserved longer than the rest of the body ought not to occasion surprise, as they are of a more solid consistence.

Remark.—As regards the occurrence of glands and vesicles in one and the same individual, it must be remarked that in all cases where a vesicle is present the gland has also been shown to occur, or certainly may be demonstrated to occur, as several observations have shown us (*Prorodon teres*), but that there are some families in which the glands, but not the contractile vesicles, have been seen (*Bacillarina*, *Closterina*). If both organs are present at the same time, and we coincide in Ehrenberg's view on the use of these organs, the supposition becomes probable that they are connected with one another. This however has by no means been confirmed.

C. Import of these two organs.

Ehrenberg considers the glands as testicles and the vesicles as seminal vesicles. In truth, this view has not been expressed by

him without reason. The analogy of this vesicle with the contractile organ of the Rotifera, which appears from its evident connexion with the ovary to be the seminal vesicle, is in favour of this view. Wiegmann, in mentioning Ehrenberg's discovery in his annual report*, remarked, that perhaps the contractile vesicle might be a heart. He states, as his ground for this supposition, that it is always formed before the longitudinal and transverse division of the body of the animal, which might appear to indicate that it was connected with some organ essentially necessary to the vital process; whilst, on the other hand, the organs of propagation, which under other circumstances did not commence their functions until the body was perfectly formed, do not require so early a formation nor so constant an action. However, it appears to me that Wiegmann's objection is weakened on the one hand by the consideration that the division is always an essentially distinct formation of the individual from that of sexual reproduction, and hence that the laws of the development of the two modes of formation of new individuals are by no means identical; on the other hand, by the supposition that at every contraction seminal fluid is not evacuated. Siebold with Wiegmann also considers the contractile vesicle as the first form of a circulatory system and the first attempt at a circulation of the nutritive fluid, but merely as a consequence of the following presupposition: "Most probably the liquid filling the cavities which become distended by a kind of diastole is a nutritious fluid emanating from the parenchyma, which at the systole is again propelled into the parenchyma, whence the necessary motion and distribution of this nutritive fluid are effected and its stagnation prevented." As Siebold's view is based upon this alone, and believing that I have removed Wiegmann's objections, and Ehrenberg's view having at least one analogy, although of itself not sufficient, I prefer the opinion of the latter; but I must not conceal the fact, that the occurrence of glands without vesicles (in the *Closterina* and *Bacillarina*) appears to show that the connexion of these two organs is not essential. Still it is not impossible, that by the perfection of our optical resources the contractile vesicle may be detected in these families also.

Remark.—It would have been an important point to have also taken *the eyes* (of both the Rotatoria and the Polygastrica) into consideration; however, as Schmidt in his paper on the Rotatoria has likewise omitted this, it affords matter sufficient for a distinct treatise.

* Wiegmann's Archiv, 1831.

EXPLANATION OF PLATES IX. AND X.

PLATE IX. B.

- Fig. 1. *Closterium acerosum*: *o o*, vesicles containing granules in constant motion; *s' s'' s'''*, minute thin cords, which I saw change in relative position; *d d*, glands; *m*, aperture (mouth); *r r*, apertures which occur in some other species of *Closteria*, and from which Ehrenberg saw minute feet project.
- Fig. 2. *Stylonychia pustulata*: *m*, mouth; *b*, contractile bladder; *f*, rigid bristles, moveable upon their bases.
- Fig. 3. *Vorticella nebulifera*: *b*, contractile vesicle; *z*, gastric cells; *s*, muscular sheath; *m*, muscle; *v v*, elongations of the muscle; *f*, attachment in the muscular sheath.
- Fig. 4. *Paramecium stomioptycha*: *a a a*, fibres which form a circle around the oral aperture; *z*, its minute appendix; *d*, gland; *s*, contractile vesicle with its appendages.
- Fig. 5. A *Vorticella*: *m*, mouth; *s*, general alimentary canal (œsophagus); *z*, gastric cells; *i i*, their hollow peduncles; *a*, anus.
- Fig. 6. *Epistylis grandis*: *m*, mouth; *i i*, gastric cells, which I saw filled, without having seen the nutritious matter pass the apparent extremity *r* of the œsophagus; *z*, filled gastric cells in connexion with the general alimentary canal.

PLATE X.

- Fig. 7. *Stentor cœruleus*: *b*, vesicle; *k*, germ; *d*, gland.
- Figs. 8—14. Stages of the development of the globular body observed in its interior.
- Fig. 15. *Stentor polymorphus*: *b*, contractile vesicle; *d*, gland; *e*, germ, as described under *St. cœruleus*.

XLVII.—Descriptions of three newly-discovered British species of Coleoptera. By T. VERNON WOLLASTON, B.A., F.C.P.S.

[With a Plate.]

Section NECROPHAGA.

Fam. MYCETOPHAGIDÆ, Westwood.

Genus *Atomaria*, Kirby.

1. *Atomaria pallida*. Oblonga, pubescens, corpore toto, oculis nigris antennisque testaceis exceptis, pallido-testaceo. Pl. IX. fig. 1.

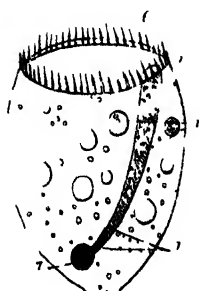
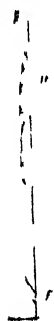
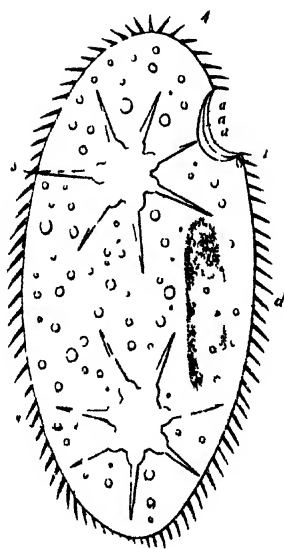
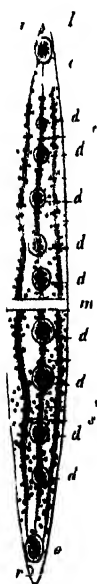
Corp. long. lin. $\frac{1}{4}$. Depressed, thickly punctured, slightly shining and pubescent. The entire insect of a uniform pale testaceous hue, with the exception of the antennæ, which are slightly darker, and the eyes which are black. Thorax broad; antennæ long and robust, the three apical joints large, forming a club, the terminal one slightly paler than the rest.

Taken at Fulbourn near Cambridge. Three specimens are in my own cabinet, and one or two more in the possession of the Rev. Hamlet Clark of Northampton.

1



B



Section PHILHYDRIDA.

Fam. ANISOTOMIDÆ, Stephens.

Genus *Ephistemus*, Westwood.

2. *Ephistemus palustris*. Niger, nitidus, subpubescens, thorace interdum piceo, antennis pedibusque testaceis. Pl. IX. fig. 2.

Corp. long. lin. $\frac{1}{10}$. Oblong-ovate, very convex, pitchy-black, shining, minutely and sparingly punctured, most obscurely pubescent. Thorax large and sometimes piceous. Legs pale testaceous. Antennæ somewhat darker, thick, with the club robust.

I possess three specimens of this very distinct species (which is at once recognised from the rest by its larger size) taken, each on different occasions, in the marshes near Cambridge. Concluding it therefore to be a fen insect, I have selected the specific name "*palustris*" as most appropriate.

Section HYDRADEPHAGA.

Fam. DYTICIDÆ, Leach.

Genus *Hydroporus*, Clairville.

3. *Hydroporus trifasciatus*. Capite fusco-ferrugineo, thorace ferrugineo basi nigra lateribus rotundatis, elytris pallido-ferrugineis, fasciis tribus sutura apiceque nigris, corpore subtus piceo, antennis pedibusque pallidis. Pl. IX. fig. 3.

Corp. long. lin. $\frac{3}{4}$. Somewhat linear-oblong, glabrous, thickly and minutely punctured. Under side piceous. Eyes black. Head dusky-ferrugineous. Thorax convex, with the sides rounded, broader than the elytra and slightly widest in front, ferrugineous with the extreme hinder margin black; a short, deep fovea on each side at the base, approximating anteriorly. Elytra depressed, with a sutural stria continuing more than half the length of the suture from the base, and a very deep one on the disc (in continuity with the fovea on the thorax) extending to the middle of the elytron and tending slightly inwards posteriorly,—pale-ferrugineous with the suture and three fasciæ black,—the first being at the base, the second (of a zigzag form, somewhat in the shape of the letter M) a little behind the middle, and the third towards the apex. Legs pale-ferrugineous. Antennæ slightly darker, except the basal joints which are pale.

This most minute and very interesting *Hydroporus* was captured in Ireland by my friend W. Clear, Esq., in the river Lee near Cork, and to him I am indebted for three specimens from which the above description was drawn.

XLVIII.—*The Birds of Calcutta, collected and described by*

CARL J. SUNDEVALL*.

[Continued from p. 407.]

58. *Falco tinnunculus*, L.

Our common Kestrel is also indigenous in Bengal. I recognised it once clearly, but procured none in that country. A young male however was taken December 5 on board ship, near the equator in the Indian Ocean, about 100 miles from Ceylon†, and another young specimen was sent home from Java by the forementioned Dr. Mellerborg. Both these birds showed, on a comparison with Swedish specimens of the second year, not the slightest difference either in colour or dimensions. This, like all small species of hawks or falcons, is called in Bengal *Sikhrie*, like the cuckoo (*supra*, no. 46). The same name is employed by Levaillant (Ois. Afr. no. 30) for a falcon which seems to be but slightly different from the year-old *F. tinnunculus*. He calls it *Chiquera* from a label which a Frenchman at Chandernagor had attached to the bird. This is evidently the same name, whose pronunciation has been somewhat differently modified. One may detect the same name changed in many other ways. For instance, under *Cuculus* no. 6 in Lath. Gen. Hist., it is written *Sercea*, *Sirkeer*, and *Surkool*. We may hence judge of the value of our information on the language of the natives, especially when they come through England; all the three names quoted, when pronounced in the English manner, are more like the correct sound than is apparent from the spelling.

59. *Falco peregrinator*, sp. nov. (obs. non ad Calcutta visus).

Niger; subtus ferrugineus, antice pallidior: pectore longitudinaliter nigro-maculato, abdomine, crisso, tibiisque irregulariter nigro-fasciatis; cauda alas superante. (Maxime affinis *F. peregrino*.)

♀ (in Mari indico d. 19 Junii) superne tota, cum alis, lateribus capitis usque infra oculos et macula genarum, latiori quam in *F. peregrino*, pure nigra, absque marginibus pallidis plumarum. Supercilia nulla distincte colorata. Gula et collum antice albedo-ferruginea striolis tenuibus nigris: colore rufo et latitudine striolarum deorsum auctis. Latera corporis, venter, tectrices alae inferiores et tibiae crebre, saturate rufo nigroque maculato fasciata. Alae nigrae: remiges maculis pogonii interioris transversis, fulvis. Penna 1^a et 3^a aequales. Rectrices fere aequales, nigrae, margine apicis albidæ; pogonium internum maculis 9 angustis, transversis rufescentibus; pogonium externum maculis obsoletis, cinerascenti micantibus. Pedes validissimi, toti flavi. Rostrum fuscescens. Cera et orbita

* Translated from the 'Physiographiska Sällskapet's Tidskrift' by H. E. Strickland, M.A.

† The following day *Cypselus affinis* (*supra*, no. 40) was procured.

fusco-flavescentes. Iris nigro-fusca. Oculi magni, valde convexi, prominuli. Longit. 18 poll. sv. (in cute asservata cauda $2\frac{1}{4}$ poll. ultra alas). Ala flexa 330 mill., tarsus 47, digitus medius 53, cum ungue 68; cauda 180. Rostrum e fauce 31, altit. 20, cum cranio 70. Cubitus 98. Statura *F. peregrini*, vel paullo robustior; rostrum præsertim crassius et convexus apparet; alæ, ratione reliquarum partium, paullo breviores.

On my homeward voyage from Bengal I obtained this handsome Falcon in $6^{\circ} 20'$ N. between Ceylon and Sumatra, rather nearer the last-named island, and at least seventy [Swedish] miles from the nearest land, viz. the Nicobar Islands. It settled upon the edge of a sail, whence it was shot down. I have only seen the specimen described, and have procured no information of any similar bird, either in books or collections. It might perhaps be regarded as a tropical variety of *Falco peregrinus*, but the pure black on the upper parts, the shorter wings and unusually large projecting eyes give this bird a marked distinction from the common forms of that species. *F. peregrinus* occurs moreover in New Holland, gray as with us, according to Vig. and Horsf., Linn. Trans. vol. xiii.* It seems that a considerable number of birds annually fly across from Sumatra and Ceylon, though they are separated by a sea of more than 200 [Swedish] miles in width. Only during my voyage through this channel I procured ten or twelve birds, most of which are mentioned above, met with half-way between these two islands. All sailors have opportunities of seeing land birds at very considerable distances from shore, and it seems not incredible that certain strong-flying species may cross the ocean, even between America and the old continent, though probably most of those which venture upon such a journey perish before they have proceeded half-way. Among other instances it may be mentioned that Catesby, in his last voyage to America, met with an owl in the midst of the ocean in 26° N. He does not tell us which species it was†.

60. *Falco melanopterus*, Daud.; Lath. Suppl. 2; Horsf. Jav. Linn. Tr. xiii.; Glog. Eur. p. 85.—Le Blac, *Levail. Afr.* 37, 36. *Elanus cæsius*, Sav. *Eg* 98. pl. 11. *El. melanopterus*, Leach, *Zool. Misc.* iii. p. 4; Vig. et Horsf. Linn. Tr. xv. *Falco dispar*, Temm. *Pl. Col.* 319 (var. Americ.).

* The New Holland bird is however distinct from *peregrinus*; it is the *F. melanogenys*, Gould.—H. E. S.

† *F. peregrinator* appears to migrate across the ocean to great distances from India. I possess a specimen which I refer to this species, procured in 1833 on board ship between the Mauritius and Madagascar. M. Sundevall gives a good figure of the species, and it is also represented under the name of *F. shaheen* by Mr. Jerdon, in his 'Illustrations of Indian Ornithology,' plates 12 and 28.—H. E. S.

Albus, supra cinereus, tectricibus alarum minoribus nigris. Ungues teretes, remigum 2^{da} reliquis longior.

♂ (Serampore d. 16 Febr.) albus supra totus pallide incanus, fronte alba. Orbita antice cum lineola superciliari nigra. Alæ extus colore dorsæ, vitta antica nigra; pennæ primariis fuscis extus obscure canis, subtus et margine albis; caudam æquantes. Cauda minime furcata: omnino æqualis; alba, pennæ 2 mediis canis. Rostrum nigrum basi flavum debile. Lora et mentum setosa. Pedes flavi, crassi, cute molli, quasi spongiosa tota reticulata. Digiti fissi, vix divergentes, subtus læves. Long. 12½ poll. Ala 254 millim., tarsus 31, digitus medius 30, cum ungue 42, cauda 124, rostrum e fronte 15.

Few land birds seem to be more widely spread over the earth than this species, which is found in Ulimaroa and the Indian Islands, in all Southern Asia, all Africa, South Europe, and all the warmer parts of America*. I only saw one specimen, which was shot on the top of a tree. The stomach was quite thin, and contained remains of a bird; it had moreover a strong smell of fish, but no remains of them were found. Nor was any trace seen of insects, which are asserted to be the sole food of this bird. Yet at that season there was no want of opportunity for an insectivorous bird to satisfy itself with grasshoppers, crickets, &c., with which the stomachs of most of the birds which I opened in Bengal were filled. This species also is called *Sikhrie* like the Kestrel, Cuckoos, &c.

61. *Falco pondicerianus*, L., Lath. no. 46; Horsf. Jav. et Raffl. Sum. Linn. Tr. xiii.—*Haliaëtus pondicerianus* recentiorum.

Rufus, capite, collo, pectoreque albis, limite definito. Adultus (Febr.—Apr.). Rostrum albidum; pedes flavi. Plumæ capitis collique angustatæ, rhachide tenui nigra. Albedo pectoris fere ad pedes extensa. Remiges primariæ nigrae, basi ad medium rufæ; cubitales rufæ, intus striis quibusdam transversis nigris. Cauda tota rufa. Magnitudo *Buteonis*; ala 360 mill., tarsus 50, digitus medius præter unguem 30. Rostrum simile *F. nævii*: majus quam *Buteonis*. Nares subrotundæ paullo longitudinales. Remex 4^a reliquis longior. Cauda rotundata, alas æquans. Tarsi antice scutis parvis; basi tantum plumati. Digiti toti scutati. (Affinis *Milvo*, nec *F. albicilla*.) Juniores (Febr.—Apr.) similes adultis, coloribus tamen paullo obscurioribus ornati.

This handsome bird of prey is known by the name *Bramin-hawk*, in Bengalese *Bramini-tjill*. The Hindoos regard it as a Bramin among the hawks, or of a better caste than the others, probably because it is the handsomest, and have a superstitious veneration for it in the same way as the peasantry with us regard the Stork and the Swallow. It occurs also in the Indian mytho-

* The American bird, *Elanus dispar*, is distinct from *E. melanopterus*.—H. E. S.

logy, and is one of Vishnu's attributes. This is one of the fortunate animals which according to their doctrine of transmigration contains the soul of a Bramin which is on the point of again entering into the human form. The Bramin-hawk is very common near the river, especially about Calcutta, but it is not found so abundantly as *Falco ater*. Further down, where the water begins to be salt, and the country is less inhabited, it is not to be seen. It seems to be found in all India and is often brought from Java. It flies in circles over the water, whence it carries off all kinds of floating offal, morsels of flesh, entrails, &c., perhaps also fish, but I never saw it or the following species pounce on entire corpses which lay upon the banks or floated in the stream. Their food was seized by the feet, and was commonly carried off to some tree or to the mast of a ship, to be there devoured, but small pieces are also eaten during flight. Their cry is a somewhat rough Hě ě ě ě - - -, almost like that of a horse or a goat. They are seen about Calcutta the whole year. According to a statement in Latham's Gen. Hist., they lay two or three eggs in trees in March and April. A number of Indian names for this bird are there enumerated.

62. *Falco ater*, Gm., Lath. no. 38; Glog. Eur. p. 82.—*Milvus ater* rec.

Fuscus, cauda longitudine reliqui corporis leviter furcata, alas paullo superante, fusca, subtus pallidius fasciata; plumis capitis latius oblongis.

♂ (junior? Febr.) totus fuscescens, pectore albido striolato, non ferrugineo, capite albido fuscoque longitudinaliter maculato. Gula albida. Longit. 21 poll. Ala 430 mill., tarsus 50, cauda 260, 1½ poll. ultra alas.—♀ major &c., ut descriptio Glogeri cit.

This species, which is spread over all the warmer regions of the old continent, is one of the most abundant near Calcutta. Its mode of life thoroughly resembles that of the Bramin-hawk. The cry is sharper, not unlike our kite's, but more interrupted, much like *heheheheee* - - - ! This species also remains stationary all the year. Both this and the last have a great resemblance, in their mode of flight and in all their habits, to *Falco buteo* as well as to *F. milvus*, but they are chiefly seen near inhabited places, and are not shy, as they are not persecuted. They are often seen sitting in trees or on roofs in the city. Both are stated to build on the stems of lofty trees. *F. ater* is named simply *tjeel*, which corresponds to our name *hawk*.

63. *Falco* . . . Fuscus, cauda longa, alba, brevius furcata, apicibus nigris. Magnitudine prioris.

I saw this hawk twice only, in the month of April, flying near Calcutta, but could not procure it. The flight and general

appearance were like those of the former, but the tail appeared longer.

Falco buteo? an *F. asiaticus*, Lath.? Near Succagor, above Calcutta, I twice saw (on March 22 and 23) a hawk which I am disposed to regard as our common Buzzard, which it resembled in size, colour, flight, and all its actions. The head was pale, with a dark band through the eyes. On one occasion it settled on a stone twenty-five ells from me, just as one of my gun-barrels, loaded with large shot, had been fired off. In the other barrel there was only sparrow-shot, so that I despaired of hitting it, and aiming straight at the bird, I fired and got nothing.

In the lower parts of the river, in the district of the Sunderbunds, when on my homeward voyage in May, I three times saw a species of bird flying at some distance, which could be nothing but a large bird of prey. It seemed to be little less than an eagle, dark-coloured, beneath white, with pointed wings, and rather smaller anteriorly than is usual with raptorial birds. The flight was like that of an eagle. Could it possibly be allied to *Falco leucopsis*, Bechst.?

I once saw a hawk fly past which I thought I recognised as a full-grown *F. palumbarius*, but I cannot assert it positively. These, and many other species of birds which follow, are only enumerated to draw attention to them.

I often heard Europeans speak of *Eagles*, which would seem not to be rare in this country, and as they asserted of their own knowledge, quite distinct from *Vultures*. Possibly they alluded to *Vultur pondicerianus*, or perhaps the large unknown bird of prey just mentioned. It should be observed that *Ciconia argala* is often called *Eagle* by the English, and the Hindoos who know English believe this bird to be the Eagle of the Europeans.

64. *Vultur bengalensis*, Gm.—Bengal Vulture, Lath. Syn. i. p. 19. t. 1 (fig. mala, eademque in Lath. Gen. Hist.). *Vultur leucocephalus* β , Lath. Syst. i. p. 3 (nec. synonym. Hasselq.). Chaugoun, *Levaill. Afr.* pl. 11 (e Bengalica; fig. mala, ut ibidem pleræque avium rapacium). (V. indicus pullus, Temm.)

Nigro-fuscus, subtus rhachidibus albis striolatus, supra immaculatus, dorso posteriore albo. Collare lanatum, album, colli infimi. Area pectoralis atra. Nares transversæ, lineares. ♂ adultus (Calcutta, Febr.). Caput et collum fuscescentia, subnuda, sparse pilosa. Caput superne fuscescentia pilosum. Occiput et nucha densius albidolana. Interscapulium et alæ fere pure nigra immaculata. Dorsum posterius ab alis tectum, pure album. Remiges cubitales extus cinerascens. Alæ tectrices inferiores (nec marginales) albæ. Cauda nigra. Gastræum nigro-fuscum, rhachidibus tenuibus, definite albis. Tibia intus alba. Area pectoralis magna, triangularis, aterrima, immaculata, brevissime et densissime plumata; lateribus posticeque

limbo albo-lanato (plerumque occultato) cincta. Collare, cum hoc limbo continuum, tantum postice plumis quibusdam brevibus, laceris ornatum. Pedes et rostrum plumbei.

Longit. 32 poll. sv. Ala 533 mill. ($21\frac{1}{2}$ poll.), cauda 225, tarsus 100. Digitus medius 100, cum ungue 130. Rostrum e fronte horizontaliter 57. Expansio alarum $7\frac{1}{2}$ ped.

♀ (verisim. junior. Calcutta, Febr.). Similis mari sed colores omnes cinerascens-tincti, minime vero rufescens-inquinati. Etiam rhachides inferiores sordide albæ. Plumæ dorsi unicolores: anteriores nigro-cinerascens reliquæ albæ. Tota area pectoralis pure atra. Ala 545 mill. Rostrum e fronte: horizontaliter 53 mill., oblique ad apicem 63. Altitudo maxillæ superioris 23. Tarsus 90. Digitus medius cum ungue 120. Cauda 215.

Juv. ut ♀ sed albedo vix ulla apparet: color omnis cinereo-fuscus, sordide rufescens-tinctus. Plumæ corporis inferioris stria albida paullo latiore quam rhachide, sed nulla pluma margine rufescens. Dorsi plumæ immaculatæ. Area pectoris fuscescente-nigra, atro-immixta. Collare lanatum sordide album. Ala 532 mill. Ceteræ dimensiones ut fæminæ. Remiges 3 et 4 æquales, reliquis longiores; cubitales posteriores attingunt apicem alæ. Cauda paullo rotundata, parum excedit alas; apice detrita, rhachidibus apice nudis spinosa. Pedes reticulati. Tarsi toti nudi. Rostrum simile *Vulturis fulvi*; non ad oculos usque fissum. Nares angustæ, paullo obliquæ.

Obs. Cel. Temminck in enumeratione *Vulturum* (Pl. Col. livr. 72, et ibid. 89) hunc pro juniore *V. indico* habet, cum verisimiliter tantum juniores *V. bengalenses* vidiſſe ei contigerit. At juniores utriusque speciei sat similes sunt. Sic etiam Rüppell hanc avem non cognovit (Ann. Sc. Nat. 1830, Dec.). *Vultur indicus*, quem tantum in musæis vidi, similior est *V. fulvo*, et in his a *V. bengalensi* differt: area pectoralis colore dorsi; collare plumis definitis, oblongis ornatum; *adultus* fulvus; *pullus* obscure fuscus, plumis ventris, *etiamque dorsi*, stria media fulva, et plerumque margine fulvo notatis; area pectoralis immaculata, rufescens-tincta.

This Vulture occurs around Calcutta the whole year, in great abundance; everywhere, even in the town, it is found in plenty. They do not strictly live in flocks, but often sit several together in the same tree, and one daily sees great assemblages of them around the corpses lying on the river bank, from which they derive their principal nourishment. Vultures walk with ease, which gives them a remarkable resemblance to turkeys, even when they are fighting for their prey; they appear equally stupid, and their fights appear to be equally bloodless. The nights and part of the days are passed in trees, where they are often seen sitting motionless with half-expanded wings, most like the Greek representations of winged griffins and sphinxes, which in this respect are evidently modelled after Vultures. They fly remarkably well, with the wings still, often to an incredible height in vast circles, to search for prey, or perhaps more often for pastime and mid-

day recreation. No sound is ever heard from them. They smell strongly of musk, which is still very perceptible, after an interval of nine years, in the stuffed specimens brought home. The Bengalese name is *Sukheni* or *Jidheni* (the accent on the final i). I heard no name which resembled the word *Chaugaun* adopted by Levaillant, which a Frenchman at Chandernagor had written on the specimen described by him. It is probably based on an incorrect adoption of the name *Sukheni*.

Among hundreds of Vultures which I saw, often only fifteen or twenty ells distant, I perceived none which were yellowish brown, wherefore I presume that the so-coloured *Vultur indicus* never, or rarely, occurs near Calcutta. A small number of them were coloured distinctly black and white like the hen above described. Most of them were grayish like the two others described.

65. *Vultur pondicerianus*, auct., Temm. Pl. Col. 2 (fig. opt.).

Niger, area pectoris concolore, lateribus posticeque latius albo cincta; capite colloque nudis, dilute rubris. Priori paullo minor.

This species is not common, and I did not procure it, but I several times had an opportunity of observing it carefully. It was rather less than the former, and is consequently one of the smaller species of Vulture. It was not distinguished by any special name, and was occasionally seen among other Vultures. It is always, even during flight, easily recognisable by the purer black colour, the red neck, and the large white spots under the body. I never saw it near enough to distinguish the projecting ear-formed folds of skin on the neck.

66. *Columba tigrina*, Temm., Wagl. no. 96.

Fuscescens, dorso griseo guttato, nigro striolato; plumis nuchæ infimæ nigris, apice cordato-incisis, gutta apicis alba. Caput canescens. Alæ breves. Rostrum nigrum; pedes rubri. Corpus subtus immaculatum rubicundo-cinerascens, abdomine crissoque albis. Rectrices laterales apice late cinereæ. Magnit. et statura *Turturis* (♂ ♀ Febr., Martii). Ala 126 mill., cauda 123, tarsus 20, digitus medius 21, cum ungue 26.

This small Dove, which is much like the European Turtle-dove, is very common near Calcutta, and was said to be stationary there. They were seen commonly two or three together, walking on the ground to pluck rice-grain, &c. on which they live. In the stomach were found moreover small snail shells, stones, &c. for trituration of the food. The flight and motions are much like our woodpigeon's, and like it they were very shy, and had a singular faculty of hiding themselves behind branches and leaves in the trees. The note is also like the woodpigeon's and has given rise to the Bengalese name *Ghugu* (the *u* as in German or *ou* in

French). The skin is tender and closely attached to the body as in our pigeons, and the feathers have the same peculiar structure of which I spoke before under the Cuckoos.

67. *Columba livia* var. *domestica*. Tame doves were kept by the natives in most villages in great numbers. They were chiefly of the race common also with us, which most resembles wild pigeons; but as they live more at liberty, without being confined in winter, they acquire their natural blue colour more frequently than with us, with two black bands on the wings. I saw some among them which had the back white, which I never saw among tame pigeons in Sweden. This species is perhaps hardly to be found strictly wild in Bengal, which country is wholly destitute of cliffs and mountains, but it appeared to me that a great portion of them were more or less in a wild state, which seems also to be often the case in South Europe.

68. *Columba* ——. Several species of pigeon were mentioned as being found wild in the country. Among them is one which the Europeans called *Ring-dove*, and which was asserted to be precisely the same as the European species, but I failed in seeing any such. It was said to arrive at certain seasons in great flocks, and then to depart again.

Another small green dove was stated to frequent certain places all the year. It was said to be shy, and difficult to see in the trees. Some which I saw in cages were said to be of this species; it was *Columba superciliaris*, Wagl. (*C. indica*, auct.), which is rather larger than a thrush, reddish gray, with green wings and back, a gray head, with white eyebrows and a cross-band on the sides of the neck, red feet and beak.

[To be continued.]

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

Oct. 13, 1846.—William Yarrell, Esq., Vice-President, in the Chair.

“Descriptions of thirteen new species of *Brachiopoda*.” By G. B. Sowerby, F.L.S.

TEREBRATULA NIGRICANS. *Ter. testâ anticè rotundatâ, posticè acuminatâ, tenuiusculâ, nigricante; valvis inæqualibus, radiatim costatis, costis rotundatis; lined marginali rectiusculâ; valvâ dorsali subtrigona, depressiusculâ, rotundatâ, lateribus posticis declivibus; foramine magno, haud integro, quadrato; areâ cardinali magnâ, planiusculâ, lateribus rotundatis; deltidii angustis ad latera foraminis coalescentibus; valvâ ventrali depressâ, transversim*

ovata; dentibus cardinalibus ut in T. psittacea; margine valvarum crenulato.

A single specimen of this very interesting species was found in the collection of the late G. Humphrey, without locality. This and the *T. psittacea* are the only species that are not punctated.

TEREBRATULA JAPONICA. *Ter. testâ oblongâ, anticè rotundatâ, tenui, albicante; valvis subæqualiter convexis, longitudinaliter radiatim striatis, striis numerosis, subirregularibus, subbifurcatis, ad latera prope cardinem confertiusculis; lateribus prope cardinem subplanulatis; lined marginali rectiusculâ, ad latera posticè declivi; valvâ dorsali posticè subproductâ, truncatâ; foramine mediocri, haud integro, perobliquo; areâ cardinali inconspicuâ, deltidii obsoletis; interno parvo, $\frac{1}{3}$ longitudinis valvæ, ramulos duos angustos, denum amentum latum flexuosum sistente; marginibus valvarum minutissimè denticulato.*

Shell oblong, rounded in front, thin, whitish; valves nearly equally convex, longitudinally radiately striated, striæ numerous, rather irregularly dichotomous and very close-set on the sides near the hinge; the sides near the hinge rather flattened; marginal line nearly straight, inclining to the sides near the hinge; dorsal valve somewhat produced posteriorly and truncated, with a moderate-sized, very oblique and incomplete perforation; cardinal area indistinct, with obsolete deltidia; internal appendages small, one-third the length of the valve, with two narrow little branches, and then a broad flexuous loop; margin of the valves very minutely denticulated.

In Mr. Cuming's collection, from Japan. Easily distinguished from *T. cancellata* of Koch by its foramen not being entire.

TEREBRATULA CRENULATA. *Ter. testâ suborbiculari, posticè subacuminatâ, subtruncatâ, crassiusculâ, albicante; valvis inæqualibus, radiatim costatis, costis paucis, majusculis, rotundatis; lined marginali flexuosâ, anticè subsinuatâ; foramine magno, subintegro; areâ cardinali magnâ, subplanulatâ, margine undulato; deltidii magnis, discretis; valvæ ventralis margine postico ad utrumque latus declivi; ossiculo interno e spinâ validâ obtusâ anticè porrectâ, ramulis duobus lateralibus retroversis; margine valvarum crenato.*

Shell suborbicular, rather attenuated and subtruncate behind, rather thick and whitish; valves unequal, with few rather large, rounded, radiating ribs; marginal line flexuous, slightly sinuated in front; perforation large, nearly entire; cardinal area large, flattish, with an undulated margin; deltidia large, separate; posterior margin of the ventral valve inclined on either side; internal appendage consisting of a single strong spine standing forward, and with two lateral reflected branches; margin of the valves crenated.

From Santa Cruz, in Mr. Cuming's collection.

TEREBRATULA ROSEA, Humphrey. *Ter. testâ oblongo-ovali, subdepressâ, anticè subattenuatâ, crassâ, rosâ, albicante radiatim pictâ; valvis subæqualibus, lævibus; lined marginali subflexuosâ, anticè reflexâ; valvâ dorsali majori, posticè subproductâ, truncatâ; fora-*

mine minimo, integro; areâ cardinali latiusculd, deltidii coalescentibus, sulco mediano discretis; valvâ ventrali ovali, anticè paululùm rotundato-attenuatâ; lineâ marginali ex umbone ad utrumque latus declivi; ossiculo costâ elevatâ, porrectâ, simplici constante; margine valvarum integro.

Shell of an oblong-oval form, rather depressed, slightly attenuated behind, thick, rose-red, painted with paler radiating marks; valves nearly equal, smooth; marginal line somewhat flexuous, reflected in front; dorsal valve the larger, rather produced posteriorly and truncated; perforation very small, entire; cardinal area rather wide, with united deltidia marked by a mesial groove; ventral valve oval, anteriorly slightly attenuated and rounded, its marginal line slanting downwards from the apex on each side; internal appendage consisting of a single elevated rib standing out; margin of the valves entire.

From Brazil, according to the late G. Humphrey. In Mr. Cuming's and other collections.

*TEREBRATULA RUBICUNDA. (T. sanguinea, Quoy, Astr.) Ter. testâ suborbiculari, posticâ subacuminatâ, gibbâ, glabrâ, rubrâ, valvis inæqualibus, subirregularibus; lineâ marginali ad latera subflexuosa, anticè sinuatâ; valvâ dorsali posticè productâ, truncatâ; foramine magno, obliquo, subintegro; areâ cardinali rotundatâ; deltidii magnis, distinctis; carina dorsali latâ, prominente, utrinque rotundato-angulatâ, obtusâ, valvâ ventrali subpentagonali, posticè angustiori, medianâ latâ, rotundato-subangulatâ; anticè subtruncatâ, sulco mediano lato, conspicuo; ossiculo interno magno, feri ut in *T. dorsata* efformatâ; margine valvarum integro.*

Shell nearly orbicular, rather acuminate posteriorly, gibbous, smooth, of a red colour; valves unequal, rather irregular; marginal line slightly flexuous on the sides, sinuated in front; dorsal valve produced behind, truncated, with a large, oblique, nearly entire perforation; cardinal area rounded, deltidia large, separate; mesial ridge broad, prominent, angularly rounded, and obtuse on both sides; ventral valve somewhat pentagonal, narrow posteriorly, broad in the middle, with rounded angles, and slightly truncated in front; mesial groove broad and distinct; internal appendage as in *T. dorsata*; margin of the valves entire.

From the Moluccas; in Mr. Cuming's collection and in the British Museum.

TEREBRATULA SANGUINEA (sanguinea, Chemn.; T. erythroleuca of Quoy). Ter. testâ suborbiculari, anticè submarginatâ, gibbosiusculâ, tenui, sanguineâ, radiis maculisque radiantibus albidis ornatâ; lineâ marginali rectâ, anticè subsinuatâ; valvâ dorsali posticè subacuminatâ, truncatâ, foramine mediocri, integro, areâ cardinali latiusculâ, marginibus subacutis, deltidii majusculis, coalescentibus; valvâ ventrali depressiusculâ, transversim obovatâ, anticè subsinuatâ, ossiculo interno primum format radios duos, deinde anulum centalem et amenta duo lateralia, demùm amentum superum integrum.

Shell suborbicular, slightly notched in front, rather gibbous, thin, of a bright light red colour, with white rays and radiating spots; marginal line straight, slightly sinuated in front; dorsal valve rather acuminate behind and truncated; perforation middle-sized, complete; cardinal area rather broad, with sharpish edges; deltidia rather large and united; ventral valve somewhat depressed, transversely obovate, slightly sinuated in front; the internal appendage at first forms two rays, then a central ring and two lateral loops, and at length a reflected dorsal loop united to the central ring; margin of the valves entire.

From the island of Zebu, attached to coral under stones; H. Cuming.

TEREBRATULA INCONSPICUA. *Ter. testâ rotundato-subtrigonalî, posticè acuminato-rotundatâ, anticè subsinuatâ, obscurè rufâ; valvis inæqualibus, glabris; lined marginali flexuosâ; valvâ dorsali rotundato-subtrigond, maximè incompletâ; areâ cardinali latâ, ad utrumque latus declivi; deltidiis mediocribus, latè discretis; valvâ ventrali transversim oblongâ, subplanulatâ, sulco mediano, lato, subinconspicuo; margine valvarum integro.*

Shell rounded, subtrigonal, acuminate and rounded behind, slightly sinuated before, dull red; valves unequal, smooth; marginal line flexuous; perforation large, incomplete; cardinal area broad, inclining on each side; deltidia of moderate size, widely separated, ventral valve transversely oblong, somewhat flattened, with a broad, rather indistinct mesial groove; margin of the valves entire.

From the late G. Humphrey's collection: locality unknown.

TEREBRATULA PULCHELLA. *Ter. testâ subovatâ, posticè acuminato-rotundatâ, lævi, albidd, lineis nonnullis radiantibus rufis; valvis inæqualibus; lined marginali subflexuosâ; valvâ dorsali subplanulatâ, posticè acuminatâ, anticè rotundatâ, foramine magno, incompleto; areâ marginali inconspicuâ, lateribus rotundatis; deltidiis parvis, discretis; valvâ ventrali subcirculari, planulatâ; ossiculo interno e gnomone porrecto, anticè posito, constante; margine valvarum integro.*

Shell subovate, acuminate and rounded behind, smooth, whitish with a few radiating red lines; valves unequal, marginal line somewhat flexuous; dorsal valve rather flattened, acuminate posteriorly, rounded in front; perforation large, incomplete; cardinal area indistinct, its sides rounded; deltidia small, separate; ventral valve somewhat circular, flattened; internal appendage consisting of a single prominent gnomon near the front; margin of the valves entire.

Found by Mr. Cuming attached to corals at Calapan, isle of Mindoro; also from the island of Cocos, Lieut. Swainson; in the late G. Humphrey's collection.

TEREBRATULA COGNATA, Chemn. *Ter. testâ subtrapezoidali, anticè rotundatâ, pallescente, nonnunquam rubente; valvis inæqualibus, radiatim obsoletè striatis, versus marginem oblitteratis; lined marginali lateraliter anticèque flexuosâ; valvâ dorsali convexâ, lîrd mediâ inconspicuâ; apice subacuminato reflexo; foramine magno,*

haud integro; ared cardinali angustâ, deltidiiis parvis, trigonalibus; valvâ ventrali planulatâ, margine postico rectiusculo; sulco mediano subperspicuo; ossiculo interno ramulos duos centrales, divergentes, ad apices expansos sistente; margine interno valvarum denticulato.

Shell nearly trapezoidal, rounded in front, of a pale colour, sometimes reddish; valves unequal, obsoletely radiately striated, the striae entirely obliterated near the margin; marginal line flexuous in front and on the sides; dorsal valve convex, with an inconspicuous central ridge, its apex somewhat acuminate, reflected, with a large incomplete perforation; cardinal area narrow, with small triangular deltidia; ventral valve flattened, its posterior margin nearly straight, with a scarcely evident central furrow; internal appendages consisting of two little central diverging branches, expanded at their apices; margin of the valves denticulated within.

There are two varieties in colour, from South Africa, according to the late G. Humphrey.

TEREBRATULA TRANSVERSA. *Ter. testâ transversim subovatâ, tenui, rudi, glabrâ, pallescente; lineâ marginali subflexuosâ, anticè subsinuâtâ; foramine maximo, incompleto; ared cardinali magnâ, planatâ; deltidiiis parvis, longè discretis; carinâ dorsali inconspicuâ, rotundatâ; valvâ ventrali transversim oblongâ, anticè rotundatâ, posticè in angulo obtusissimo desinente; sulco mediano subinconspicuo, rotundato; margine valvarum integro.*

Shell transversely subovate, thin, rugose, smooth, of a pale colour; marginal line somewhat flexuous, slightly sinuated in front; dorsal valve of a somewhat tetragonal ovate form, very obtusely angular behind and reflected; perforation very large, incomplete; cardinal area large and flattened; deltidia small, very distant; mesial ridge rounded, indistinct; ventral valve transversely oblong, rounded in front, and finishing in a very obtuse angle behind; mesial groove rounded; indistinct margin of the valves entire.

In Mr. Norris's collection and in that of Mr. Jancle.

TEREBRATULA RUBELLA, SOW. *Ter. testâ subovatâ, posticè subacuminatâ, subgibbâ, anticè subsinuâtâ, rubrâ; valvis inæqualibus, glabris; lineâ marginali rectiusculâ, anticè subsinuâtâ; valvâ dorsali posticè subacuminatâ, reflexâ, carinâ medianâ nullâ, sulco mediano obsoletissimo, foramine parvo; ared cardinali angustâ, ad latera rotundatâ, deltidiiis majusculis, coalescentibus; valvâ ventrali ovatâ, sulco mediano latiusculo, emarginationem anticam efformante; ossiculo interno ut in T. australi; margine valvarum lævissimo.*

Shell nearly oval, rather acuminate posteriorly, a little gibbous and slightly sinuated anteriorly; valves unequal, smooth; marginal line nearly straight, a little sinuated in front; dorsal valve rather acuminate posteriorly, reflected, without any mesial ridge, but with a very obsolete mesial furrow; perforation small; cardinal area narrow, rounded at the sides, with rather large united deltidia; ven-

tral valve ovate, with a broad mesial groove forming a sinus in front; internal appendage as in *T. australis*.

From Japan. In Mr. Norris's and Mr. Cuming's collections.

TEREBRATULA LABRADORENSIS. *Ter. testâ suborbiculari, posticè acuminatâ, obtusâ, crassiusculâ, albâ; valvis valdè inæqualibus, radiatim obsoletè costatis; lined marginali subflexuosa; valvâ dorsali anticè rotundatâ, posticè acuminatâ, obtusâ; foramine magno, integro; areâ cardinali magnâ, subplanulatâ; deltidiiis majusculis, coalescentibus; carinâ dorsali inconspicuâ; valvâ ventrali suborbiculari, posticè subacuminatâ; margine valvarum crenulatâ.*

Shell suborbicular, acuminate behind, obtuse, thickish, whitish; valves very unequal, obsoletely radiately ribbed; marginal line somewhat flexuous; dorsal valve rounded in front, acuminate and obtuse behind; perforation large, entire; cardinal area large, somewhat flattened; deltidia rather large, united; mesial ridge indistinct; ventral valve nearly orbicular, slightly acuminate behind; margin of the valves crenulated.

In the British Museum. From Labrador; C. Goodsir.

TEREBRATULA ALGOENSIS. *Ter. testâ suborbiculari, posticè subacuminatâ, anticè sublobatâ, albâ; valvis radiatim striatis; carinâ dorsali conspicuâ, rotundatâ; foramine magno, incompleto; margine valvæ dorsali minutissimè crenulatâ.*

Shell suborbicular, slightly acuminate behind, rather lobed in front, whitish; valves radiately striated; mesial ridge distinct, roundish; perforation large, incomplete; margin of the dorsal valve very minutely crenulated.

A single valve of this specimen is in the British Museum, labelled "Algoa Bay, Bowerbank."

"Descriptions of new species of *Marginella*." By G. B. Sowerby, F.L.S.

MARGINELLA FUSCA. *Marg. testâ elongatâ, subovali, posticè subangulatâ, anticè latè marginatâ, in medio paululùm contractâ, fuscâ, vel pallidè purpureâ, fusco-trifasciatâ; spirâ breviusculâ, apice obtuso; aperturâ angustâ, columellâ rectiusculâ, plicis quatuor, quarum duæ anticæ albæ, prominentibus, spiraliter elongatis; labio externo albo, intus in medio incurvo, extus fusco, latè reflexo.*

Differing from *M. nitida* in the colouring and the shortness of the spire, and in the outer lip being more broadly reflected.

In Mr. Cuming's collection. From the West Indies.

MARGINELLA CRASSILABRUM. *Marg. testâ subovali, in medio subangulatâ, pallidè griseo-fulvâ; spirâ brevi; anfractibus distinctis, ultimo dilatato, ad spiram elevato; columellâ plicis quatuor, quarum duæ anticæ prominentes, spiraliter elongatis; labio externo, crasso, latè incurvo, angulato, extus varicoso, ad apicem tumidè elevato.*

This species is remarkable for the broad angular disc formed by

the outer lip, which is much thickened at the back and raised so as nearly to cover the spire.

In Mr. Jackson's and Mr. Cuming's collections. From the West Indies.

MARGINELLA TÆNIATA. *Marg. testâ ovali, cylindricâ, pallidè fulvâ, fasciis fuscis tribus cinctâ; spirâ brevi; aperturâ elongatâ, posticè subangustâ; columellâ plicis quatuor, quarum duæ anticæ majores; labio externo lævi, latè reflexo.*

Differing from *M. avena* in having a shorter spire and the outer lip more broadly reflected.

In Mr. Cuming's collection. Locality unknown.

MARGINELLA ALBO-CINCTA. *Marg. testâ subconicâ, subangulatâ, lævi; spirâ productâ; anfractibus angulatis, ultimo fasciâ albâ prope angulum, et altero ad terminum anticum cincto inter fascias fusco maculato et punctis nigris picto; columellâ quadriplicatâ.*

Provisionally described from a young specimen in Mr. Cuming's collection. When full-grown it would probably resemble *M. nubiculata* in form.

MARGINELLA PSEUDO-FABA. (*M. Faba*, Lam. Anim. s. vert., vii.)

Marg. testâ angulatâ, anticè attenuatâ, subrecurvâ, pallidè fulvâ, griseo-nebulatâ, punctorum irregularium seriebus 10 sparsim cinctâ; spirâ prominulâ; anfractibus angulatis, ad angulum validè crenulatis, crassis, paululûm arcuatis, posticè angulatis, anticè emarginatis, attenuatis.

Much more angular than the true *M. Faba*, and has the anterior part of the body-whorl tapering and bent upwards.

In Mr. Cuming's collection. From the river Gambia, West Africa.

MARGINELLA FAUNA. *Marg. testâ ovali, subcylindricâ, pallidissimè carnèâ, spirâ brevi; columellâ obliquè quadriplicatâ; labio prope medium incurvo, extus subincrassato.*

Slightly resembling *M. pallida*, but more oval; the lower part of the aperture less open, and the outer lip thicker.

In Mr. Cuming's collection. From the isle of Curasso.

MARGINELLA MULTILINEATA. *Marg. testâ ovali, stramineâ, lineis rubris numerosis cinctâ; spirâ penè celatâ, apice fasciâ rubrâ circulari cincto; aperturâ anticè et posticè emarginatâ; columellâ albâ, in medio tumidâ, anticè callosâ, plicis quatuor ad quinque inæqualibus; labio externo albo, intus crenulato, in medio subangulato, extus tenuiter reflexo.*

On the whole resembling *tessellatus*, but it is much shorter, with the outer lip less varicose on the outside, and coloured by numerous red lines instead of the square patches.

In Mr. Cuming's collection. From Belieze, bay of Honduras; Mr. Dyson.

MARGINELLA VARIA. *Marg. testâ elongatâ, lævi, anticè expansâ, albâ, vel fuscâ, vel fusco vel rubro trifasciatâ, vel purpureo longitudinaliter et spiraliter interruptim fasciatâ; spirâ plus minusve productâ; aperturâ posticè angustâ, anticè subexpansâ; colu-*

mella quadriplicatâ; labio externo in medio incurvo, extus leviter varicoso.

Differing from *M. lactea* of Kiener in being wider at the anterior termination, and in the outer lip not being so much elevated.

From the West Indies. Varieties are from Belize, bay of Honduras.

MARGINELLA SIMILIS. Marg. testâ ovali, stramineâ, griseo-nebulatâ, lineis creberrimis interruptim cinctâ; spirâ penè celatâ; aperturâ angustâ, anticè et posticè emarginatâ; columellâ spirâ tumidâ, anticè varicosâ, irregulariter septemplicatâ; labio externo posticè spiram paululùm superante, intus crenulato, extus nigro maculato vix marginato.

The spire is less concealed, and the margin of reflected lip less distinct than in *M. interrupta*. The colouring is more mottled.

In Mr. Cuming's collection. From the Brazila.

ENTOMOLOGICAL SOCIETY.

August 4th, 1845.—The Rev. F. W. Hope, F.R.S., President, in the Chair.

Mr. Raddon brought for distribution a number of specimens of the rare *Actebia præcox*, and exhibited *Goliathus Drurii* and *torquatus*, *Mecynorhina frontalis*, *Petrognatha gigas* and other rare insects from the Gold Coast.

Mr. Douglas exhibited *Adactylus Bennettii* and other *Lepidoptera*, from St. Osyth in Essex. Also illustrations of the transformations of *Tortrix Galiana*, which feeds, in the larva state, on the worm-wood, and its parasitic Ichneumon.

Mr. Samuel Stevens exhibited a variety of insects recently captured at Arundel, including specimens of *Claviger foveolatus*, obtained from the nests of two different species of ants.

Mr. Edward Doubleday exhibited drawings of several species of *Papilio*, including *P. Hippodamas*, Bdv., *P. Polyuctes*, Doubled., and a new species allied to *P. Payeni*, from the Himalayan Mountains. He also described a complicated apparatus for capturing and killing minute *Lepidoptera*, invented by Herr Reissig.

The following memoirs were read:—

"The Completion of the Biography of Fabricius," translated from the Danish by the Rev. F. W. Hope, who announced his intention of presenting the Society with impressions of a portrait of Fabricius, to accompany the memoir in the Transactions.

"Description of a new species of Grasshopper from New South Wales." By W. F. Evans, Esq.

Ehippitytha maculata, Evans. *Wing-cases pale green, each with sixteen to nineteen or twenty roundish spots of a bluish-black colour running along the inner edge of the marginal or principal nervure and the inner margin of the wing-case; wings one-eighth of an inch longer than the wing-cases, of a pale green colour, becoming gradually of a lighter tint towards the outer margin,*

with a pink tinge near the apex (as in the wing-cases) and a single bluish-black spot; tibiæ of the hind legs with four bands of fuscous brown, of which colour are also the two basal tarsi. Expanse of wings $4\frac{1}{2}$ inches; length of body $1\frac{1}{2}$ inch.—In Mus. Britann., Hope, and in my own.

“Description of a new species of *Paussidæ* from India.” By J. O. Westwood, F.L.S.

The insect in question, forwarded by W. H. Benson, Esq., of the Bengal Civil Service, is closely allied to *Ceratoderus bifasciatus*, forming therewith a separate genus divisible into two subgenera, as follows:—

MELANOSPILUS, nov. gen.

Antennæ claud depressæ, quasi 5-articulatæ; palpi maxillares articulo 2do maximo, 4to gracili, præcedenti minori; palpi labiales articulis tribus, 3tio majori ovali apice subtruncato; pedes haud dilatati tibiis apice haud calcaratis tarsisque articulo basali tribus sequentibus majori.

Subgenus 1. *Dimeroderus*, Westw.

Corpus supra opacum plaga mediæ elytrorum polita; palpi maxillares articulo 2do ferè rotundato depresso; prothorax bipartitus lateribus angulatis; tibiæ apicibus externè obtusè truncatis.

Sp. 1. *Melanospilus* (*Dimeroderus*) *Bensoni*, Westw. *Luteo-fulvus, prothoracis parte antica angulis productis subacutis, parte postica quasi 4-lobata elytris versus medium plaga magna subtriangulari ad suturam haud extensa.* Long. corp. lin. 3.—Hab. in Indiâ Orientali. D. Benson.

Subgenus 2. *Ceratoderus bifasciatus*, Westw. Arcan. Ent. ii. pl. 58. fig. 1.

“Notes on the Habits of various Indian species of *Paussidæ* and *Cetoniidæ*.” By Mr. Benson, in a letter addressed to Mr. Westwood.

The species of *Paussidæ* above described by Mr. Westwood is stated by Mr. Benson to have been captured by him under a brick near the river Ganges, about fifty miles below Cawnpore, last year, in the cold season, and this year, in January, he took another under a stone in a black-ant's nest, between the Savalik range and Saharunpore. On Mr. Benson's estate, about 7500 feet above the level of the sea, at Rockville, Landour, Mussoorie, Dr. Bacon last year took a *Paussus* by sweeping in the grass, closely allied to *Paussus denticulatus*, Westw. Arcan. Ent. ii. pl. 92. f. 1, but which Mr. Benson has subsequently distinguished under the name of *P. Nauceras*. At Rajpore, in the valley of the Dhoon, Dr. Bacon had also taken *P. pilicornis*, Donov., and a larger species as yet unfigured, which Mr. Benson has since described under the name of *P. Baconis*. It was captured in a sweeping-net among grass and bushes.

A small species of *Valgus* (fam. *Trichiidæ*), with four small acute protuberances on the podex, was also forwarded. This species loves

to bathe itself in the pollen of dahlias at Landour. (The specimen is so saturated with grease as to be undeterminable.)

He had captured a Cetoniideous insect, which he regarded as the female of *Heterorkina Hopei*, and which was no other than *H. Bengalensis*, as out of hundreds of *H. Hopei* which he had seen and taken there was not one female, whereas all the specimens of *H. Bengalensis* proved to be of that sex; the species should therefore take the name of the male, *Bengalensis* being inapplicable to a hill-species. The wild indigo is a favourite resort of this species and of *H. nigratarsis*, as well as of a coppery *Cetonia*. *H. glaberrima*, Westw., frequents sweating wounds in oaks in great profusion, and is accompanied more sparingly by *Rhomborhina opalina* and *R. apicalis*. *Jumnos Roylii* is abundant in the hollows of oaks, and is frequently taken in flight. A species of *Cetonia* of a velvet-black colour, with a red band round the thorax and a pale golden spot on each elytron, without any visible external difference between the sexes, somewhat resembling *C. tricolor*, but with the thorax rounded and very different from that insect or any *Polybaptus*, occurs chiefly on the *Hibisci*, and especially *Rosa Sinensis*, at Rajpore, and even as high as 7000 feet above the sea. Of *Dynastes Hardwickii*, figured by Capt. Boys in the 'Journal of the Asiatic Society of Bengal,' N.S. no. 54, Mr. Benson had taken two males and a female, the latter without horns; also an intermediate male, with a very short horn on the head and only the humeral horns of the thorax. Many Chinese forms occur at Landour, among them *Oniticellus cinctus*, *Callidea ocellata*, and a *Sugra* which he took in abundance at Rajpore, but it is very local: the males and females differ in the toothing of the hinder tibiae. When disturbed they throw themselves off a bush, but are active when on the wing. Their brilliancy suffers much in drying.

"Note on the production of a Queen-Bee from a neuter larva, and on the impregnation of the Queen." By Mr. Golding; accompanied by a specimen of the queen's cell artificially produced.

On the 28th of June, 1845, the writer placed a bit of comb containing workers' brood in one of his hives which had lost its queen. Two days afterwards he removed the royal cells which it contained, whereupon the bees immediately (July 1st) commenced three royal cells, from which, on the 12th of July, two queens were hatched, the third having proved abortive. The writer agrees with Mr. Westwood that there are no royal eggs, but only male and female ones, the larvæ produced from the latter being subjected to two distinct modes of treatment; the peculiar treatment of the brood destined to royalty consists, in Mr. Golding's opinion, far more in the singularly different construction of royal cells, than in any subsequent treatment of the brood deposited in them: he has in fact very little faith in the *royal jelly* notion.

It appears certain to the writer that the impregnation of the queen-bee takes place in the open air. Young queens, when but a few days old, have been repeatedly noticed to leave the hive, of which the writer mentions an instance observed by himself, where a

young queen, which had left the mirror hive, mounting high in the air on her departure, was found to return after an absence of six minutes, when a small white substance, about as large as a pin's head and somewhat soft and ragged, was seen adhering to the extremity of her body. (This is what is alluded to by Dr. Bevan in the 'Honey Bee,' p. 35, and which Mr. Golding considers to be evidence of fecundation.) He considers that it is invariably the *old* queen of the stock which goes off with the *first* swarm. (See article "Swarming" in Dr. Bevan's 'Honey Bee,' chiefly contributed by the writer: v. Advert. p. viii.) He had traced a *marked* queen from hive to hive, in first swarms, until she was three years and ten months old, the oldest recorded. He had taken much pains in tracing the queens, sometimes slightly notching the tip of the wing, or cutting off an antenna, and always with the above result; indeed, for some days after the first swarm leaves the hive there is no queen at liberty in it, until the senior princess comes forth and commences piping. Another interesting instance to the like effect had occurred during that and the preceding season. A labourer in his employ, George Waters, an excellent practical apiarian, observed last year that, on the coming off of a first swarm, the queen in vain attempted to fly, falling from the stool. He gave her to the swarm, after noticing that one wing was much injured. This swarm was again left single-hived the then present year, and on their swarming he again observed the same disabled queen attempting to join the swarm; thus proving not only that the old queen issues with the first swarm, but also that Hüber was probably right in his idea that one act of impregnation suffices for the life of a queen, as in this case the queen was unable to fly, and therefore there could be no repetition of the act *whilst on the wing*. On the decease of the old emigrating queen-bee, it is of course necessary that a fresh queen should be produced; Mr. Golding has in fact proved that colonies do sometimes—always, he supposes, when needed—raise young queens without swarming. In fact, being convinced that queens after their third season become less prolific, he has sometimes destroyed the old queen of a first swarm before putting it back, purposely that the colony should have a young queen; families which have old queens most frequently failing from their loss or diminished fecundity.

On the 9th of June, 1832, Mr. Golding's Hüber-hive swarmed; and upon examining it directly afterwards, it was found to contain three royal cells sealed up and one unsealed, which was also found sealed up on the 14th. On the 29th of June, 1830, Mr. Humphrey's Hüber-hive swarmed, and on examining it three closed royal cells were found, and five others in various stages, there being certainly no queen at liberty in the hive at the time*.

* It is proper to observe, that several of the above observations were written by Mr. Golding in reply to a suggestion made by me to him, that as the swarming of the hive-bee was analogous in so many respects to that of other social insects, it seemed reasonable to suppose that the primary object of the swarming was the impregnation of the queen-bee, and consequently that it was the newly-hatched princess which went off with the swarm, the old queen remaining in the hive not requiring a second impregnation.—J. O. WESTWOOD.

September 1st.—The Rev. F. W. Hope, President, in the Chair.

A new species of Goliath Beetle, sent from Cape Palmas by Dr. Savage, and a new Australian *Phasma*, were exhibited by the President.

Capt. Parry exhibited *Goliathus Smithii*, *Passerini*, and other rare *Coleoptera* from Port Natal.

Mr. Samuel Stevens exhibited *Mythimna turca*, *Alcis sericearia* and *roboraria*, *Eupithecia togata*, Hb., *Phycita Abietella*, *Graphiphora rhomboidea*, *Polia tincta*, *Triphana fimbria*, *Cucullia Lychnitis* and other *Lepidoptera*, chiefly from Black Park, most of which had been set according to a plan which he has adopted in order to obtain great uniformity in the position and deflexion of the wing. The plan consists in having a slab of cork cut with a longitudinal groove down the middle for the reception of the bodies of the moths, and with the sides sloped for laying out the wings, the slopes being so cut as to bring the apex and hinder margin of the wing to nearly the same level as the lower portion of the thorax. Setting-boards with different-sized grooves and slopes are of course required for different-sized insects.

Mr. Douglas exhibited eight new species of small *Lepidoptera*, since described and figured in the 'Zoologist.' Also a variety of other rare species, including a specimen of *Orthotenia quadrana*, Hübner, taken at West Wickham on the 27th of May.

Mr. Bedell exhibited numerous specimens of a small moth, *Gracellaria V-flava*, and its metamorphoses, taken in a wine-cellar, the larvæ of which are supposed to feed on *Rhacodium cellare*. Likewise a specimen of the rare *Acronycta Alni*, taken on hazel at Box-hill on the 11th of August.

The following memoirs were read:—

The continuation of a memoir "On the New Holland *Cryptcephalidæ*." By W. W. Saunders, Esq.

PLEOMORPHA, W.W.S.

Head vertical, immersed in the thorax nearly up to the eyes. Antennæ short, 1st joint robust, pyriform, 2nd short, turbinate, 3rd to 6th slender, gradually increasing in length, 7th to 10th broad, triangular, terminal joint broad, ovate. Thorax transverse, rounded and gibbous in front, with the centre of the hind margin produced. Elytra rounded at the apex, forming with the thorax an obtuse oval.

From the distinctly-serrated club of the antennæ of the minute insects composing this genus, the author thinks the true place of it is not far from *Clythra*.

Sp. 1. *Pleomorpha Davisii*, W.W.S. *Head rufous, with a black transverse line; antennæ rufous, club black; thorax rufous; elytra punctate-striate, testaceous, with the base, suture and apex black. Length $\frac{10}{16}$ ths of an inch.*—Taken near Adelaide by Mr. Davis. In Mus. Brit. and Westwood.

Sp. 2. *Pleomorpha ruficollis*, W.W.S. *Head black, with a patch*

of rufous on the face; antennæ rufous, club black; thorax bright rufous; elytra dark bronzed green, punctate-striate. (Cryptocephalus æneipennis, Dej.?) Length $\frac{8}{100}$ ths of an inch.—Inhabits Van Diemen's Land. In Mus. Westwood.

Sp. 3. *Pleomorpha rufipes*, W.W.S. Head dark bronzy brown; antennæ rufous, club black; thorax and elytra dark bronzed brown; legs bright rufous, with dusky tarsi. Length $\frac{8}{100}$ ths of an inch.—Inhabits Van Diemen's Land. In Mus. Westwood.

BOTANICAL SOCIETY OF EDINBURGH.

Dec. 10, 1846.—Professor Balfour, President, in the Chair.

A letter was read from M. Lange and other Danish botanists, offering to supply Scandinavian specimens in exchange for British, and transmitting a catalogue of the Danish Flora, with the regulations of the Scandinavian Association for the exchange of botanical specimens. In the list there are 1285 Phanerogamous species enumerated, 263 of which are not found in Britain; and thirty-nine species of Ferns, of which six are not British.

The following communications were read:—

1. Dr. Balfour read an account of a botanical trip which he had made with some of his pupils to Clova, Glen Isla, and Bracmar, in August last. Dr. Balfour alluded in an especial manner to the Alpine Flora of the British Isles, the Scandinavian type of Prof. E. Forbes, and illustrated it by a complete series of specimens, arranged according to the natural system on pasteboard, so as to be seen at one view. He noticed Prof. Forbes's theory as to the mode in which the plants migrated at the glacial epoch. He also alluded to the geological nature of the district visited, which is the richest in Britain as regards Alpine species, and the character of the Flora on the different kinds of primary rocks, especially granite and mica-slate. Specimens of the rarer species collected during the excursion were exhibited, among which the following are interesting as having been found in new localities, or rediscovered in old ones:—*Carex rupestris*, abundant in Glen Dole, the specimens being unusually large; *Poa Balfourii*, near the falls of the Whitewater, and also in Glen Isla and on Lochnagar; *Poa casia*, in Glen Isla; *Poa laxa*, and the variety *flexuosa* of Parnell, Lochnagar and Glen Dole; *Luzula arcuata*, Lochnagar; *Saxifraga rivularis*, in several new stations on Lochnagar, some specimens six inches long; *Gentiana nivalis* in a new spot in Glen Isla, specimens varying from $\frac{1}{10}$ th of an inch to six inches in length; *Ranunculus acris*, var. *pumilus*, Wahl., Lochnagar; *Phleum alpinum*, rocks near Loch Brandy; *Carex vaginata*, abundant on Ben na Muick Dhui; *Carex curta*, var. *alpicola*, more correctly *C. Persoonii*, near the summit of Lochnagar; *Woodсия hyperborea*, rocks in Glen Phée; *Hieracium nigrescens*, Ben na Muick Dhui; and *H. inuloides* in Glen Clova.

Dr. Fleming expressed doubts as to the correctness of Prof. Forbes's theory regarding the migration of the Scandinavian Flora, and no-
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ticed the evident depression of the land along the eastern coast of Scotland, from which he inferred that the level of the German Ocean must have been greatly altered, and was inclined to believe that the similarity of the Floras of this country and of Norway and Sweden might be accounted for by supposing that these countries were at one time united to Britain.

2. Read extracts from a letter from Dr. W. H. Campbell of Demerara, giving an account of an excursion up the Essequibo river, in the course of which he saw *Victoria regia* in a lake or lagoon, about half a day's journey above the Itabally Rapids. He described the petioles as densely covered with prickles, and varying from fifteen to twenty feet in length, the leaf itself being five to six feet long. He also procured specimens of the root and bark of the plant which yields the Hiarry poison, which he describes as a huge *bush-ropes* or climber. Unfortunately neither the *Victoria* nor Hiarry plant was in flower. The latter is being analysed by Dr. Sheer, the agricultural chemist at Demerara.

Dr. Douglas MacLagan stated that he had already made an analysis of the Hiarry root, and had detected a peculiar volatile acid to which he believed the poisonous properties of the plant were due.

3. Read a supplement to a "Synopsis of the British Rubi," by Charles C. Babington, M.A. (see *Annals*, vol. xix. p. 17.)

Specimens of *Trichenium*, collected by Dr. Learmouth in Australia, were exhibited, and the peculiar structure of the calycine hairs shown under the microscope.

In the report of the last meeting of the Society, *Thorea ramosissima* was inadvertently stated to have been found at Studley, Yorkshire; and *Hormospora mutabilis* in the Thames, near Walton. It should have been the reverse.

At this meeting the election of office-bearers for the ensuing year took place, when Dr. R. K. Greville was elected President, and Dr. Archd. Inglis, Sir William Jardine, Bart., Professor Balfour, and Rev. Dr. Fleming, Vice-presidents.

MISCELLANEOUS.

Description of an Agaric new to the British Flora.

AGARICUS CAPERATUS.—*Pileus* convex, orbiculate, obtusely umbonate, even, very dry, of a uniform gall-stone yellow, usually paler about the top, covered with a mealy powder of the same colour, which in some places is gathered into an imperfect scaliness, the margin inflexed, entire or more or less sinuated: *veil* as thick as writing-paper, persistent, stretched between the margin and stem, to which it is closely attached, thickly covered with the same powder as the pileus, but more distinctly squamulose: *flesh* thick, solid and firm, white, not changing colour, mild and insipid in taste. *Gills* numerous, adnate, four in a set, dry and smooth, sienna-yellow, juiceless: *sporules* elliptical, very light honey-yellow. *Stem* cylindrical, as thick as a man's thumb, erect and solid, the root rounded but not bulbous, whitened with the mycelia, the shaft of the same

colour as the pileus, paler on the lower half, covered with the ochraceous powder or slightly squamulose, the flesh white, yellowish under the epidermis; the portion of stalk within the veil is pale, a very little fibrillose, but not powdered. Diameter of the pileus 3 inches; height of the stem 5 inches, the diameter nearly an inch; breadth of the gills $\frac{2}{10}$ ths. From the woods at Anton's-hill, September 16, 1845.

This truly magnificent agaric was ascertained satisfactorily to be the *Agaricus caperatus* of 'Fl. Dan.' t. 1675, by the Rev. M. J. Berkeley, to whom a specimen was sent. It is not the *Ag. caperatus* of the 'English Flora,' nor the *Ag. pudicus* of Bulliard; and is a beautiful addition to the already extensive list of British species, for which we are indebted to the researches of Miss Anne Hunter, an honorary member of the Club. The spores, Mr. Berkeley says, are very peculiar. "Its greatest peculiarity," says Miss Anne Hunter, "is its being so profusely covered over its pileus, curtain and stem with a yellowish powder, in such quantities as to make it disagreeable to gather, as gloves and everything it came in contact with was covered. And I am much struck with the toughness and permanency of the curtain, which remains after the pileus has attained its full size."

When small and young the pileus is obtusely campanulate, but in other respects it does not differ from the mature plant. Miss Hunter has found it on one spot only in the wood behind the house of Anton's-hill, and there sparingly. Like most of its genus it is eaten greedily by slugs and the maggot of a dipterous fly; and it seems to be, says Miss Hunter, "a most favourite food of a sort of beetle," which permits very few specimens to attain maturity without great mutilation.—*From the Transactions of the Berwickshire Naturalists' Club*, vol. ii. p. 174.

Description of a new British Sponge. By Dr. JOHNSTON.

HALICHONDRIA MACULARIS.

Sponge forming a thin circular spot one or two lines in thickness, and rather more than an inch in diameter, of a wax-yellow colour, spongy texture, but not reticular, and soft when recent; the surface even, somewhat hirsute, with pores invisible or scarcely visible to the naked eye, and no fecal orifices. *Spicula* numerous, long and straight, needle-shaped, smooth; they are all alike in figure and do not much differ in length.

This is amongst the least attractive of its genus. The only species to which it is closely allied is the *Halichondria sanguinea*, from which it is distinguished by its colour and less fleshy texture, and by the straightness of the spicula. These are remarkable for their length; and the obtuse head is very slightly sinuated a little below the extremity, but it requires a high magnifier to discover this character.

This new species was found spreading, lichen-like, on the inner surface of an old valve of *Cyprina islandica*, which was brought up, from a depth of about thirty-five fathoms, by the baited lines of our fishermen.—*Ibid.* p. 196.

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